

Looking beyond the trees

Visual
Stewardship
of the Working
Forest

Visual Resource
Management Conference

Compendium

Kamloops, British Columbia, Canada
April 17 to 19, 2001

SPONSORED BY

British Columbia Ministry of Forests and
Forestry Continuing Studies Network



BRITISH
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**Looking Beyond the Trees:
Visual Stewardship of the Working Forest Conference**

**Compendium of Papers
Presented**

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Ministry of Forests
Forest Practices Branch

August 2001

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Introduction

One of the challenges facing today's forest managers is trying to find ways to carry out timber harvesting activities while ensuring that the range of ecological and social values of the forest are maintained. Research suggests that as much as 87% of our perception of the landscape is based on visual stimuli. As a result we routinely make judgements about the condition and desirability of our environment on the basis of visual information. If the change looks bad, we tend to judge it negatively. The larger, the more dramatic, and the less aesthetic the change in the environment, the more people tend to assume that the environment has been damaged.

Visual Resource Management is about managing perceptions by making human made intrusions look as natural as possible, while meeting other forest management objectives. Many jurisdictions around the world manage for aesthetics and have developed procedures, policies and technologies for managing this resource.

The desire for information on the subject of Visual Resource Management is greater than ever before, from all players, agencies, industry and contractors.

The British Columbia Ministry of Forests and the Forestry Continuing Studies Network hosted a conference as a means of sharing experiences, technology and information.

The name of this conference was *Looking Beyond the Trees: Visual Stewardship of the Working Forest*. It was held at Kamloops, British Columbia April 18 & 19 2001.

This conference brought together leading experts and researchers, from around North America and the United Kingdom.

Through a mixture of plenary and break out sessions, speakers proposed technological solutions, answered operational issues and shared research findings on seven subject areas :

- Public Perceptions
- Visualization Technology
- Silvicultural Systems
- Stewardship/Certification
- Visual Design
- Economics
- Policy Influences

In all 27 different papers were presented. These are printed in their entirety or in a shortened form in the compendium.

About the Compendium

This compendium of papers was produced as a means of providing participants with a record of papers presented and issues discussed at the *Looking Beyond the Trees: Visual Stewardship of the Working Forest* conference. It is not meant to be a formal published proceeding. There is no set word count, nor has a single style been set for the collection of papers. While the compendium contains some formal papers, complete with references, many papers are simply power point presentations, reproduced as Microsoft word documents.

Some limited editing was carried out. This was done primarily to ensure that spoken text read like written text and to ensure that the title/author name/contact information at the opening of each paper was consistent.

Readers will find that speaker papers are not arranged in the order of presentation or under the seven topic areas used during the conference. In order to make the printing and compilation of the compendium as easy as possible, papers have been grouped into two sections: those papers with colour, and those without. The first 15 papers (pages 1-128) have been reproduced in colour. The remaining 12 papers (pages 129-235) have been reproduced in black and white. Within each of these grouping, the papers are arranged alphabetically by author.

Speaker contact information is provided at the beginning of each paper for easy reference.

Forest Stewardship and Visual Quality: The Adams Lake Experience

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RR#2, Chase, BC, V0E 1M0

Phone: (604) 679-3234 Fax: (604) 679-3545 Email: marino_bordin@interfor.com



Adams Lake Lumber has been in operation since 1942. This business is the largest employer in the area (nearly 300 people depend on Adams Lake Lumber for employment). Half the wood supply needed for the mill comes from an operating area contiguous to the lake.



- ICH leading
- Ground-based harvesting dominates
- 30% of area is visually sensitive



Visual Mgmt History

Biodiversity Concept

Visual Tours

Leadership



Adams Lake Experience

Up front planning
MOF involvement



Staff Training

Logger "Buy-in"



Operational Flexibility
Logger Discretion



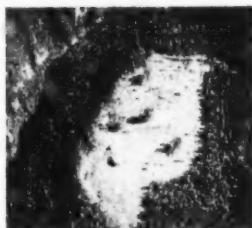
Retention Strategy
Maximize effectiveness
Minimize volume /costs



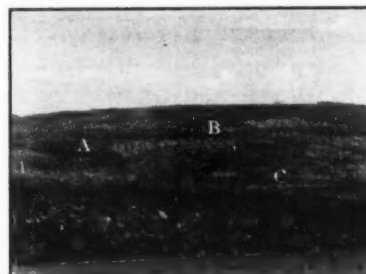
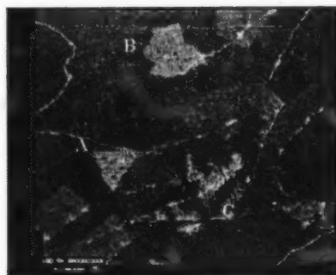
"Retrievable" Patch



Fir Beetle Salvage
Area 10.3 ha.
Retention VQO



Cable Blocks: Area 15.3 ha; PR VQO





CP 56-4: Area 9.8 ha.
PR VQO



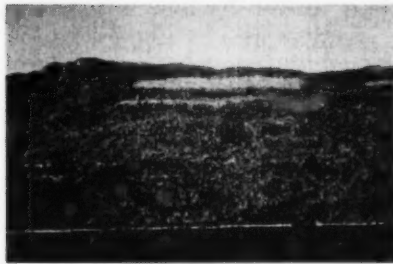
Before Helicopter Harvest PR VQO



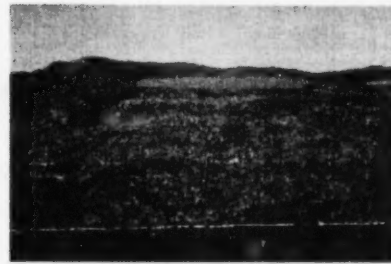
After Helicopter Harvest



Monitoring



Interfor CP 528
Visual Rehab Project
1997



Interfor CP 528
2005 if no change occurred



Post Harvest
August, 2000



Anticipated green up in 2005



Visual Rehab Project



High environmental standards are required to maintain or enhance this wood supply. We have been certified under ISO 14001 and are pursuing other forms of certification. The Adams River Sockeye Salmon run is world-renowned.

Keys to success:

- Cooperation
- Minimal impacts
- Improves Timber Supply....But

Sometimes... Visual landscape design objectives are difficult to achieve. We are currently finalizing a proposal to increase the cut.

Visual Resource Management in the Bureau of Land Management and the U.S. Forest Service: Philosophy, Technology, and Training for the Future

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Introduction

Good Morning. I'd like to first thank the Ministry of Forests and the Continuing Studies Network for inviting me to share with you some of my experiences in visual resource management.

I am a landscape architect for the Bureau of Land Management, shared with the U.S. Forest Service. My first exposure to visual resource management issues was while working with Brian Orland as a research assistant at the University of Illinois. At that time I produced several photo-realistic simulations for Terry Slider and the Deschutes National Forests. After graduation I took a job working for the Malheur National Forest in Eastern Oregon. Since then, I have spent the last six years working on projects for both the Forest Service and the Bureau of Land Management (BLM). In that time, I've learned a lot about scenery management, landscapes, and people's relationships to each.

During my talk today, I'd like to share with you a quick overview of the Forest Service and the BLM, then a brief history of each agency's visual management system. I'll follow this with a discussion of some of the emerging issues and trends, each agency's responses to these trends, and the methods being used to implement their systems. Finally, I'll take a look into what the future might hold.

Agency Backgrounds

This map illustrates the forested regions of the United States. It is a good map with which to talk about exactly where the BLM and Forest Service lands are located in the U.S. for those who might not be familiar that. The BLM and the Forest Service are the two



primary land management agencies in the U.S. Both operate on a multiple-use mission (overseeing timber, grazing, mining, recreation, wildlife, etc.). As we'll see in the next couple of slides, the Forest Service lands are located primarily in the areas shown as forested regions on this map, while the BLM lands are in large part located in the wide open areas in between the forested regions.

This difference in land allocation geographically also correlates with some distinctions between the agencies' cultures. For example, the Forest Service is divided into many more individual field units than the BLM, but each is much smaller in acreage. The BLM, in contrast, has fewer individual units, but each comprises larger acreage given the vast open spaces in which each is situated. These BLM lands have had the image of being the lands that Americans drive *through* to get somewhere else (i.e., a national forest). However, with the rapid population growth in the west today, coupled with an increasing desire by recreationists to get away from the masses, these last remnants of true wild, open spaces are becoming the sought-after "Wild West" of yore.

For those who are unfamiliar with the U.S. landscape in the context of these two agencies, the images below should help. In general, Forest Service lands are forested, whereas the BLM lands, with a few exceptions, are mostly open, arid, backcountry landscapes. While these photographs are gross generalizations, they drive home the point that one is more likely to find the forested alpine lakes and meadows in Forest Service lands, whereas the vast, open, high desert, sage-and-tumbleweed experience is going to be found on BLM lands.



Visual Management Chronology

Now it's time for a quick history lesson. I'll describe briefly how each agency has dealt with visual resources in the past. Prior to 1970, visual resource management was really limited to use along highways and within special recreation areas. Then, in the late sixties, adverse visual effects were becoming obvious. An increase in clearcutting was occurring in the nation's forest as a result of providing necessary lumber that fed the post-war construction boom. The Forest Service responded with a system designed to mitigate the visual effects of harvest. This point really marks the birthplace of both agencies' visual resource management systems. The work of Burton Litton and Sylvia Crowe was melded together with work of Warren Bacon from the Forest Service to produce the Visual Resource Management System in 1974. This same decade saw the passage of many of our environment laws, mandating the management of the scenic resources within both agencies:

Forested Lands Policy and Management Act (1976) FPLMA:

"... public lands will be managed in a way to protect the quality of the scenic (visual) values of these lands."

National Environmental Policy Act (1969) NEPA:

"... assure for all Americans, aesthetically pleasing surroundings ..." and "... utilize a systematic, interdisciplinary approach which will ensure the integrated use of environmental design arts in the planning and decision making."

The Forest Service adopted the Visual Management System, or VMS, in 1974. The BLM used the VMS to create the agency's own version, the Visual Resource Management System, or VRM, in 1984. Both systems were based on the premise that visible evidence of human activity is considered a deviation from the "natural-appearing landscape," which is the ultimate scenic experience goal. Both assumed that fundamental design principles (form, line, color, texture) could be used to quantify resource values via taking inventory, setting objectives, and evaluating effects. The reality of these systems is that they both attempt to quantify an inherently qualitative resource and they both are reactionary only in use. Landscape architects were considered to be the custodians of the programs originally, as these were the individuals trained in the landscape design principles.

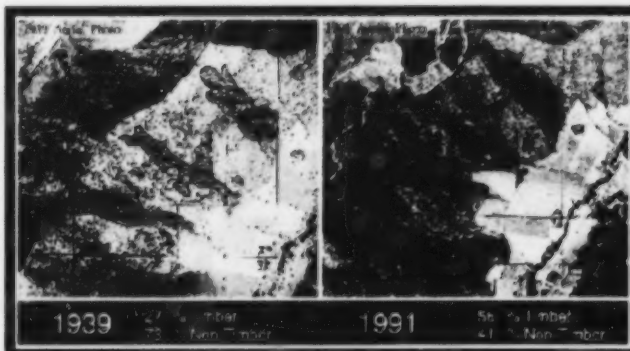
Emerging Issues

Since then, a new set of issues has been emerging and challenging the implementation of these systems and their existing premises and assumptions. Through 100+ years of fire suppression, forested lands in the U.S. have

developed into densities and compositions that are inconsistent with historic fire disturbance patterns. As a result, stands are dying and at risk of larger and more intense fires than would normally occur. Yet, many of these stands do not show the visible effect of human alterations and would, in each system, be ranked as having a high scenic quality regardless of their poor ecosystem health.



try to deal with these increased fuel loads, the use of prescribed fire and other fuel treatments becomes necessary. So the question becomes, if fire is used as a treatment, are its visible effects still

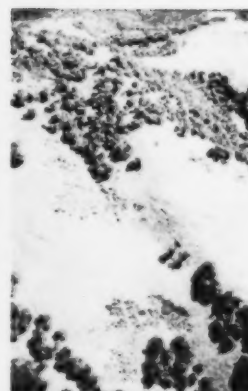


The increased risks of fire posed by this imbalance in the forest are more significant with the increasing development in the rural-wildland interfaces. Millions of people live in or adjacent to forested areas that are at extremely high risk for catastrophic fire. As the agencies

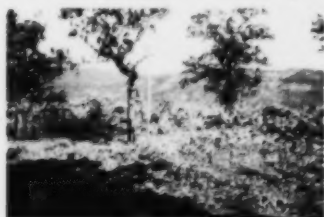


considered natural-appearing? The Forest Service and BLM systems don't have a good way of dealing with these types of situations. From a scenery context, should removal by fire be treated any differently than removal by logging?

As the use of federal lands for commercial logging continues to decrease in scope, the types of prescriptions used on these lands continue to be modified. No longer are the large-scale, clearly noticeable types of harvest occurring—those that both visual management systems were designed to react to. Instead, we are now seeing treatments that have very subtle changes in texture such as thinning, density management, and fuel reduction prescriptions over much larger, less concentrated areas.



Another emerging trend is that of native oak woodland restorations. Our vegetative treatments are no longer limited to those which produce a commodity. Past fire suppression has allowed for open oak woodlands to become crowded by encroaching conifer species. So another ecosystem out of whack has emerged here. In this case, removal of timber species is not for commodity, but for restoration of the native deciduous species. This means that a potential conflict is developing where the necessary treatment for restoring the landscape to a natural-appearing one is to harvest a visually significant component of the adjacent conifer.



Today's management must consider what a forested area comprises. Is it just a regeneration area for future timber production, or is it a patchwork of connecting habitat for elk and deer? Is a tree considered timber or habitat? Can it be both? Does the removal of a tree for habitat's sake mean the same visually as its removal for commodity?

All of this is sandwiched in the middle of a growing west, a west of new communities of educated people from other parts of the country, settling into towns rich in traditional uses and values. Forested areas are now as likely to be valued as scenic backdrops as for anything else. In many cases, small, isolated western communities once dependent on timber for their economic vitality are turning to recreation as a source of sustainability. In these areas, the scenic value of the forest surrounding these towns may, in fact, be becoming more important than the value of the timber itself. This growing west is placing increased demands on other resources, such as water. The



drought conditions facing us all this year are a reminder of this significance. Reservoir lake levels are at all-time lows. Should the scenic quality of the forested area surrounding a lake decrease with the scenic quality of the lower lake levels? Do we rate the forested ecosystem just down to the shoreline? Or do we include the effects associated with reservoir lakes and the recreation experiences they provide?

All of this leads us to the cultural values of the people living in the landscape. These values might be spiritual or historic in nature. The types of activities people participate in will effect their expectations of scenery, and therefore, the relative degree of alterations that would be acceptable. We're talking about a sense of place. What's the sense of place of the reservoir lake? Does it include a low-water level image? What about the oak woodland being encroached by douglas-fir? Or the area burned by a wildfire versus an area changed by a prescribed fire? Is it a ski slope or a clearcut? Does it make a difference?



Agency Responses

How have the two agencies responded to these new challenging issues? Well, the Forest Service embarked on a mission to update its VMS. The result was the Scenery Management System (SMS), which Terry Slider has described in detail. Rich with landscape architects, the Forest Service chose an inclusive approach—an *outside-in* premise in which these other resource values (habitat, ecosystem health, cultural values) could be integrated into what constituted scenery. The assumption was thus modified to include more than just what was visible.



The BLM instead chose to stay with its original system, but modify the way in which it was implemented. Now shy of landscape architects to be custodians of the program, the BLM felt the most pragmatic approach was *inside-out*, in which the visual resource message would be spread to other resource specialists. The assumption here is that the planning processes would then account for the inclusion of these other resource issues (habitat, ecosystem health, cultural values, etc.). The responsibility for visual considerations in surface-disturbing activities was shared with all specialists, including management and staff. By default, the recreation staff became the custodians of the VRM program.

In disseminating the message, the BLM thus thrust itself into a mission of training non-landscape architects in the techniques of design. Regional and field unit coordinators were assigned for advice and counsel. Training in VRM is now conducted yearly. Designed as a five-day, hands-on, process, attendees work in groups on real-life projects. The training is targeted to any employee involved in surface-disturbing activities.

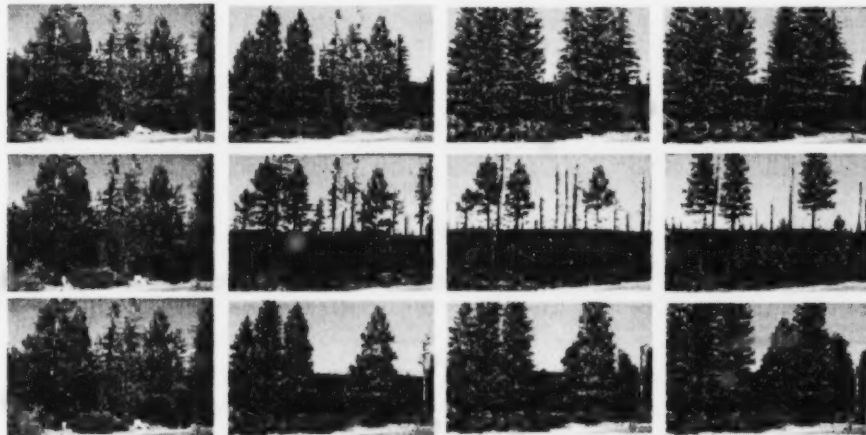
The BLM created a "contrast-rating form" in an effort to make the quantification of the visual resource easier for non-design professionals. Sectioned off into form, line, color, and texture, this rating form is intended to be a fairly straightforward way of quantifying the features of the existing and proposed landscapes to determine discord or harmony when compared.

In addition to support by geographic information systems, a website was set up to provide additional support and information on the VRM program. A visual resource simulation course is also now being offered to aid specialists with techniques in simulating expected effects of surface-disturbing activities. A VRM database is also being developed (eventually to be web-accessible) to enable specialists to query specific project situations and get examples of the good, bad, and ugly solutions.

The Future

How effective have the two different approaches been? The Forest Service is still in the process of transition into the new SMS, with many foresters still hanging on to the old ways of the VMS. The BLM is just beginning its training of others in the VRM systems as well. So, bottom line now, is that the jury is still out. Regardless, there are some opportunities for making the most of these systems. I'll discuss a few of my pulpit points, if you will ...

We wouldn't use a single photo to represent our children, but we are quick to do so with scenery. If we were trying to show someone what our child looks like, we'd pull out the whole wallet with a whole slew of photos from when they were a baby, in grammar school, off to college, etc. I'd recommend that be the same thought when we discuss scenery. The landscape should be described in terms of the processes that created it, not just the snapshot visible today. It's dynamic, and we should describe it as such. **Process, not snapshot.**



Along similar lines, technology should be used to educate and communicate rather than to be simply a tool for displaying potential visual effects. Three-dimensional rendering software is extremely effective in showing the geography of an area in a format that the public can more easily understand than a two-dimensional map.

Simulation software can be used to help describe the dynamic quality of an ecosystem, to actually illustrate the process, not just the snapshot. It could be used to show the effects of different management alternatives over time. Simulations should be used in concert with each other. Abstract, scientifically based models can be shown next to photo-realistic images to share

in communicating the philosophy behind forest management, while at the same time helping the public to better understand what the abstract simulations represent. Simulations could also be linked with more advanced models and decision support systems, as Brian Orland discussed. In any situation, it's important to remember that the more realistic (true to life) a simulation appears, the more significant its deviations from reality (inaccuracies) will be to the public.



So, I'll leave you with a few parting words from a wise old man named Leopold, who seems to have had a pretty good handle on the sticking intangibles of "visuals", "natural-appearing", "ecological health", "recreation uses", and "cultural values", long before we developed systems to deal with them.

"...the motorist who exclaims about the flowing contours that lead the eye upward to far summits is unaware...It does not occur to him that the hills, too are covered with ecological face powder."

"The outstanding characteristic of perception is that it entails no consumption and no dilution of any resource."

"Recreation is not the outdoors, but our relationship to it."

Aldo Leopold

"More Than Meets the Eye": Understanding Sense of Place for Landscape Management

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Abstract

This paper discusses an experiential study of landscape from the perspective of inhabitants of a region. While the dominant conceptualization of landscape aesthetics in resource management emphasizes the visual, this study revealed that in addition to the visual and visible dimensions of landscape, aesthetic sensibilities take in "more than meets the eye." In particular, for inhabitants of the Cariboo region in central British Columbia, sense of place—both character of place and attachments to place—was significant to aesthetic experience of landscape. The methods used to obtain inhabitant perspectives and the place-based and other outcomes of the study are discussed and compared to outcomes of conventional visual assessments. Implications for the practice of landscape assessment and environmental management more broadly are also presented.

Overview of Landscape Assessment in Environmental Management

- 1960s - environmental legislation: Consideration of aesthetic values systematically in resource management is generally cited as emerging in the 1960s. At this time, environmental protection legislation was introduced in response to concerns over environmental quality, one aspect of which was the aesthetic dimension, conceived of as "beauty."
- 1970s – methodologies develop: Throughout the 1970s, methods and techniques for landscape proliferated rapidly, building on methods from earlier times and undergoing use in a variety of contexts, from environmental impact assessment to resource planning and urban design.
- 1980s - reviews of the field; attempts to integrate: By the 1980s, researchers began to examine the myriad of literature, studies and application accumulating in the field, and identified a number of different approaches to landscape assessment. As well, attempts were made to integrate approaches and develop overarching theories of landscape aesthetics.
- 1990s – entrenched approach: By the 1990s, methods for assessing aesthetics in landscape, especially as "scenic beauty" or "visual quality" had become institutionalized, even entrenched, within government programs.

Approaches to Landscape Assessment

Reviews identified consistently categorizations of at least three distinct approaches to landscape aesthetics and assessment:

- "Expert": In the professional or "expert" approach, the arrangement or design of visual landscape elements determine overall visual-aesthetic quality. These attributes, identified and

judged by trained professionals, become the basis of management. This approach has led to (and is based on) aesthetic management focused on the designed landscape and an "objective" observer. This approach dominates the practice of landscape assessment (e.g. BC Ministry of Forests Visual Resource Management (VRM) program).

- "Experimental": In this approach, landscape is conceptualized as a "stimulus" to which humans respond. Predictive landscape dimensions, where ratings of beauty are correlated to variations in measured landscape dimensions, are developed. Policies and management maintain landscapes that have features positively related to, or predicted by, perceptions.
- "Experiential": The third model, the experiential, is based on the understandings of participant-observers who attend to meaning and context in landscape. This approach has received the least attention in resource management, because its methods have been considered to be too individualistic and subjective. However, because of the attention to context and meaning, it has been suggested that this approach offers greater validity than other approaches.

Objectives of Research Study in the Cariboo

The study has two objectives:

- To develop a method based in the "experiential" approach.
 - this involved consideration of at least four characteristics identified in the literature: beyond the visual (a broader range of landscape entities and incorporation of other sensory experience); an "insider" perspective (that is through the eyes and thoughts of inhabitants of a place); everyday landscapes (ordinary and everyday, not just spectacular, places); and methods that are reflective (allow thinking about landscape, values, assessing)
 - to consider the method and its outcomes for informing the practice of landscape assessment (as practiced in British Columbia's VRM program).

Comparative Case Study Design

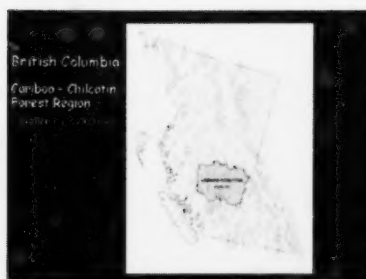
Using a qualitative two-part case study, landscape assessment was analyzed in the Cariboo region of BC

Experiential Approach

- Develop and apply experiential method
- Analyze and interpret landscape images

Expert Approach

- Review landscape assessment policy and procedures
- Examine applied outcomes



Area of the case study: the Cariboo region, B.C

Participant-Directed Landscape Imaging (PDLI)

Participant-Directed Landscape Imaging was used. This is an interactive method involving three data collection components: self-directed photography (participants were given single-use cameras to capture landscapes photographically); journals (participants wrote notes of reflection upon seeing the photos, describing meanings and context); and in-depth interviews (carried out with participants to further detail their images and discuss landscape)

Outcomes of Cariboo Study Image Analysis

The results of the image analysis are shown in the table below:

Outcomes of Cariboo study image analysis

Focus themes	Significance themes	Type of assessment
• landscape elements	important because .	• instrumental evaluations
• locales	• it is characteristic • it is special	• affective appraisals
• experiences	• I'm attached . • it connects	• sense of place descriptions
	• it is ecological . • it is beautiful .	
	• it makes me feel .	

Summary of Cariboo image analysis: Focus themes – what did participants focus on in their images? ; and Significance themes – why were the images important, significant, meaningful?

Place and Sense of Place

Place has long been a key concept in human geography. It has been variously defined: as “a portion of space experienced by people,” for example. Generally, geographers consider three overlapping, interrelated elements:

- Location: expressions of absolute or relative position
- Locale: a setting or context for social action and interaction
- Sense of place: associations, feelings of meaning and identity people hold

- Character of place
 - memorability, distinctiveness
 - "genius loci"

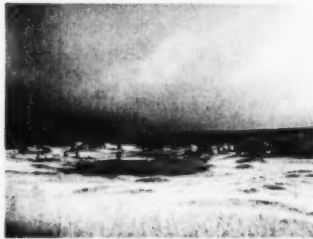
- Attachment to place
 - to specific place or type of place
 - "topophilia"

Sense of Place in the Cariboo

- Landscape as "nature": natural process or "organic" human change
- Landscape as "heritage": significance of past to present in the Cariboo
- Landscape as "a way of life": Cariboo as a place to live, work and play

"... rolling golden hills, typical sky on the road to Spring Lake, to my favourite spot..."

"... the creek moves slowly here, and there are always ducks around and trout..."



... nature

"...reflecting the sky, containing it gently in the land..."

"... a spiritual dimension to the lakes of the Cariboo ... the 'essence' of water..."

... heritage

"... our history...a mining town in its present day setting."

"... a change from mining to forestry..."

"... the others are gone, and people want some connection to the past..."



... heritage

"... the Marguerite ferry. ... People fought hard to keep this old system of crossing the Fraser ... some connection to the past ..."

"... the beauty of the rain on the river ..."



... way of life

"...an original Crown grant in HBC times..."

"... fall plowing at Bouchie Lake, my place..."

"...the pastoral scene ... tells me ... there is stability in it all ..."

"... peaceful scenery where people choose to live..."

"... significance in the mix of park, local history, growth and development... over time..."



... home

"... part of the reason I chose to live in the Cariboo ..."

"... on the way to work ... less stressful than time in traffic..."

Informing the Practice of Landscape Assessment

There are two approaches to this:

- Supplemental to "expert" methods
 - for example, as public input
 - scale: region or sub-region? Cost-effectiveness? Follow-up?
 - Reorienting landscape assessment
 - for example, attention to sense of place

Reorienting Landscape Assessment

The experiential method and its outcomes support the following emerging trends in resource management:

- Recognition that ecosystem management includes place – Shared aspects of place, especially attachment, can serve as a starting point for planning.
- Recognition of the value of subjectivity and qualitative methods – Despite the importance of science and measurement, there is increasing importance on qualitative information and on intangible, unquantifiable values.
- Changing forms of participation and management – There is no single "public," but rather a variety of interests to be included. The focus of resource management as a state-centred, technocratic activity is changing to a "bottom-up," participatory and pluralistic endeavour.

Calibrated Images Visualizing Forest Landscapes for Public Choice Surveys

Dr. Wolfgang Haider

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Wolfgang Haider, REM, SFU; Brian Orland, Penn State; Terry Daniel, U. Arizona; Donald Anderson, StatDesign, Co; Michael Williams, Advanis, Edmonton; Len Hunt, OMNR

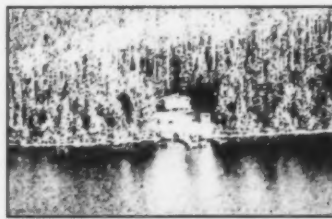
Overview

- Remote tourism in Northern Ontario and the research context
- Choice surveys
- Calibrated images
- The survey instrument & sampling
- Results
- Decision support tool

Remote Tourism in Northern Ontario



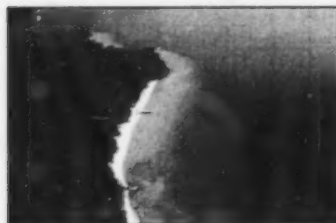
Lodges



Outposts



Favorite Activity is Walleye Fishing



Logging is the Second Land-Use



Aquatic Guidelines require 30m buffer

The Research Context

- Timber Management Guidelines for the Protection of Tourism Values (1984)
 - expert based approach
- Class EA 1987-1994

- research on the effects of timber management on tourism
- research on the effectiveness of the guidelines
- CNFER (Centre for Northern Forest Ecosystem Research) est. 1990

Research Challenges

- A widely dispersed tourism industry
- Approx. 1300 locations
- Little systematic data available
 - about tourism industry and clients
 - about the forested environment
- Challenge: How to link research to tangible management concerns?

Fundamental Research Directions

- Focus on client (tourist) perspective
- Approach the problem in its multivariate nature
- Include visualization

--> Stated choice surveys

--> Calibrated images

IDEALLY COMBINED IN ONE STUDY

Choice Surveys

The multivariate nature of a simple recreation experience

Harvest	Slots	Expectations
> 6 fish / day	> No restrictions	> mostly small
> 3 fish / day	> 30 - 40 cm	> mostly medium
> CAR only	> 25 - 45 cm	> mostly large

$3 * 3 * 3 = 27$ possible combinations

Possible Response Tasks

Lake A:	Lake B:
6 fish / day	CAR
30 - 40 cm	no restrictions
mostly medium	mostly small

- On a scale from 1 to 10 how much do you like to fish Lake A? (*Conjoint Analysis*)

- If Lakes A and B were the only types of lakes available for fishing in Area X, which one would you choose? (*Discrete Choice Experiment*)

Discrete Choice Experiments

- Experimental design (fractional factorial design)
- Method of analysis (discrete choice model = random utility model)

Methodology

Discrete Choice Experiment

- an alternative to revealed (observational / actual) preference data
 - going beyond attitude and opinion research
 - one form of trade-off analysis
 - evaluation of non-existing alternatives
 - decision support tool

Attribute List

- | | |
|---|--|
| <ul style="list-style-type: none"> • Accommodation <ul style="list-style-type: none"> • outpost camp (running water y/n) • lodge (American Plan or Housekeeping) • Price of Package (\$\$) • Wildlife Viewing • Crowding <ul style="list-style-type: none"> • no other anglers • occasional fly-in • another outpost camp • Distance from Home to Airbase • Fly-in | <ul style="list-style-type: none"> • Quality of Fishing <ul style="list-style-type: none"> • Walleye (excellent / good) • Northern (excellent / good) • Lake Trout (good / na) • Bass (good / na) • Limits <ul style="list-style-type: none"> • 6 fish/day, no size restriction • 6 fish/day, only 1 trophy • 3 fish/day, only 1 trophy • catch & release only • Size of Fish <ul style="list-style-type: none"> • mostly moderate, occasional trophy |
|---|--|

Attribute List - Timber Management

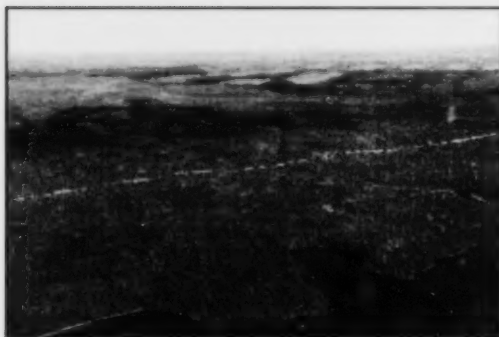
- | | |
|--|---|
| <ul style="list-style-type: none"> • Noise at the Lake <ul style="list-style-type: none"> • none • occasional, distant • occasional, near lake • Forest Type <ul style="list-style-type: none"> • Conifer • Mixedwood • Road <ul style="list-style-type: none"> • none • 50-100m • 500m • 2000m • Size <ul style="list-style-type: none"> • 15% of eligible area • 50% of eligible area | <ul style="list-style-type: none"> • Buffer <ul style="list-style-type: none"> • 100m • 500m • 1000m • 3000m • Shape <ul style="list-style-type: none"> • Regular • Irregular • Blocks <ul style="list-style-type: none"> • single • multiple • Age <ul style="list-style-type: none"> • fresh brown • greened-up |
|--|---|

Digitally Calibrated Images

Digitally Calibrated Images (Describing Attributes Visually)



Attribute	Level
Buffer Width	100 m
Residuals:	None
Road:	No Road
Forest Type:	Conifer
Size:	Large
Shape:	Regular
# Blocks:	Multiple
Color:	Fresh Brown



Attribute	Level
Buffer Width	3 km
Residuals:	None
Road:	500 m
Forest Type:	Conifer
Size:	Large
Shape:	Regular
# Blocks:	Multiple
Color:	Greened-up

Steps in Calibration of Landscape Images

- Develop list of attributes & attribute levels
- Define a prototype 'scene'
 - oblique aerial view (400 - 600 m above ground)
 - shoreline in the foreground
 - horizon in the background
- Collect a sample of images
- Standardize images
- Generate image according to design plan

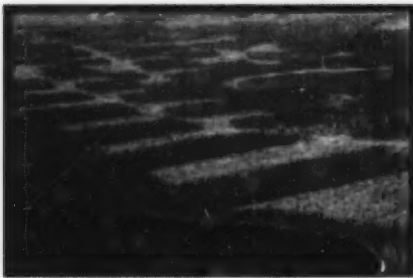
Preparation of Images



Before



After



Calibration of Images (2)

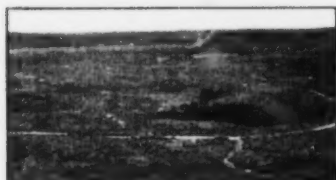
- Use actual scenes to verify distances and appearances
- Validate scenes with experts
- Revise
- Test scenes with naïve subjects
- Include scenes into choice sets

The Survey Instrument

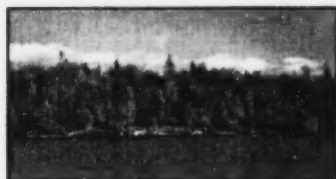
10



Area immediately around your facility on the destination lake



Example: view 4 - 6 miles away



Example: shoreline view

Accommodation:

American plan lodge
4-day \$620, 7-day \$860
Large lodge (60-80 people), another lodge on the lake
30 minutes fly-in time

Setting:

Occasional wildlife along shore
No shore noise

Fishing:

Excellent walleye fishing
Excellent northern pike fishing
No lake trout fishing
No bass fishing

Limits & Expectations:

3 fish possession limit, only one trophy size
Mostly moderate size fish, often a trophy

Distance:

375 - 525 miles (easy day drive)

The Instrument

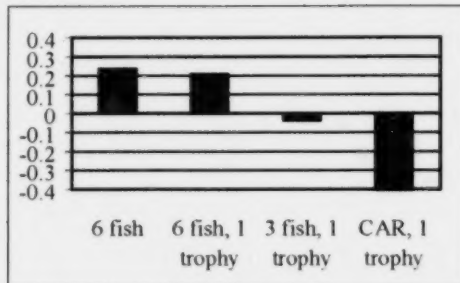
- 128 Choice sets
- 8 booklets, 16 choice sets per booklet
- No image appeared twice in any booklet
- 1/4 pristine scenes

The Survey

- Sample of 1,000 respondents
- Interviews at 7 trade shows in US - midwest
- Task - Choose among:
 - left
 - right
 - fish outside Ontario
 - do not fish

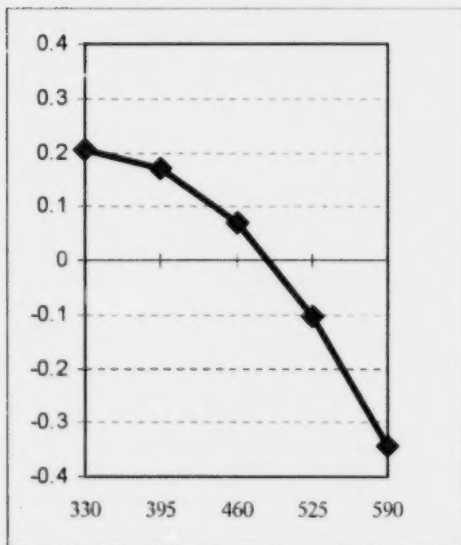
Results

Catch Expectations by Species

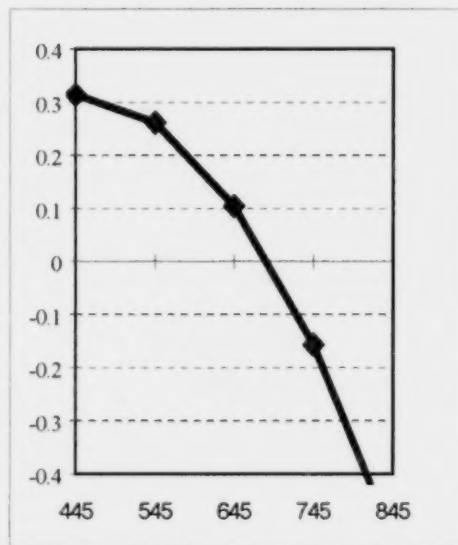


Price for an Outpost with Running Water

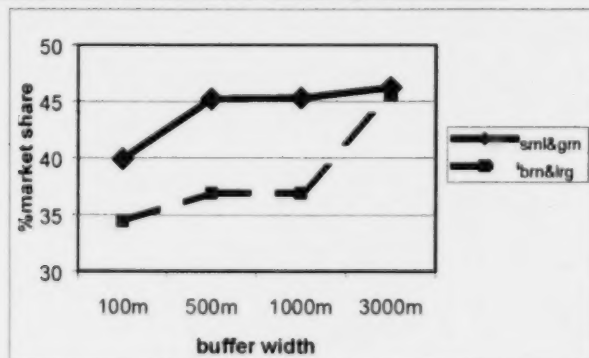
4 day Accommodation



7 day Accommodation



Relationship between Buffer Width, Size and Age of Cutover



Visual Design Considerations in Ski Resort Planning

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Ski Resort Planning Considerations

- Breakdown of the skier marketplace
- Tourist expectations
- The tourist contradiction
 - They all want to stay in log lodges and complain about the brutal cutblocks
- Economic diversification
 - Forestry, tourism and sustained prosperity

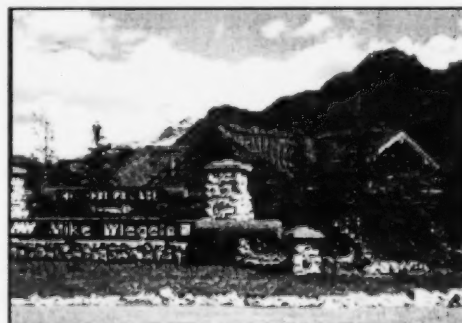
Ski Resort Planning

- The creation of master plans to guide in the development mountain resorts
- Planning process
 - Vision, goals and objectives
- Mapping
- Inventory
- Analysis
- Range of opportunities
- Stakeholder consultation
- Concept development
- Public review
- Interagency review including visual impact analysis
- Concept refinement
- Resort master plan



Mike Wiegale Helicopter Skiing

- Largest single base Heli-skiing resort in the world
- 1,600 square miles of operating area
- 10 helicopters transporting 100 skiers per day
- Economic mainstay of the region
- Strong repeat visitation
 - 90% sold out for next year (2002)
 - 50% sold out for the following year (2003)
- Winter and summer operations



Heli-skiing

- For dedicated skiers, Heli-skiing is their dream come true
- Helicopters act as ski lifts, accessing virgin slopes of powder snow
- High end and expensive sport



Heli-skiing and Crown Land

- Very highly regulated
- Operators in B.C. may only ski within their tenure area
- Heli-skiing operators share the crown land with other licensees including forest companies

Issues and Opportunities

- Male dominated, macho, expensive, powder skiing skills
- Highly weather dependant
- Fat skis and snowboarding
- More facilities: Down Days & families
- Demand for high end real estate
- Employee base needs more facilities
- Sense of obligation to local population
- Visual impact from logging



Goals and Objectives

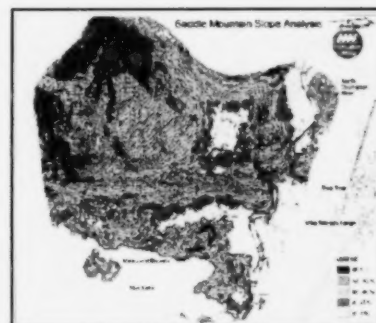
- Develop lift serviced powder skiing
- Improve the quality of living for locals
- Develop a wide range of year-round facilities
- Reinforce the environmental attractiveness of the area
- Reduce the negative visual impact of logging

Saddle Mountain Development Potential

- Excellent mix of terrain
- Close to existing Heli-Resort
- Opportunity to improve visual impact of logging

Development Potential

- Site inventory and analysis
- Digital mapping
- Digital Terrain Model
- Slope analysis, elevation analysis, aspect analysis, fall-line analysis
- Environmental audit
- Opportunities and constraints



Design Parameters

- Opportunities and constraints
- Maintain environmental sensitivity
- Emulate Heli-skiing
- Utilize the 4,300 feet of vertical
- Limit skiing to 300 skiers per day
- Integrate developable base area lands
- Maximize solar access
- Improve visual impact from the Heli- Resort

Saddle Mountain Master Plan

- Comfortable carrying capacity: could hold 5,000 skiers per day, limited to 300
- High speed, low capacity lifts
- Wide trails to replicate open bowl skiing
- Differing degrees of glading to replicate tree skiing and to soften the visual impact of the "vertical cutblocks"
- Revegetation to improve visual quality of the existing cutblocks

Interagency Review Process

Master plan is submitted for commentary and approvals by various Government Agencies including:

- BC Assets and Lands Corporation
- Regional District
- Ministry of Environment
- Ministry of Highways
- Ministry of Health
- Ministry Forests

Public Review

- The public is invited to view and comment on the Master Plan through a series of open house stakeholder meetings
- Visual impact is always an issue

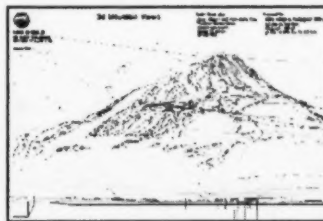
Saddle Mountain Master Plan

Visual Impact Analysis

- Key part of the consultation process
- The objective is to illustrate the proposed impact, and in the case of Saddle Mountain to hopefully show improvements
- The challenge was to complete the visual impact analysis in a timely, cost efficient fashion

Visual Impact Analysis

- The mountain plan is digitized and draped over the Digital Terrain Model
- We used a combination of Quicksurf and Autocad
- We then were able to view the mountain from any vantage point or angle
- Critical views are photographed
- Digital Terrain Model views were created, exactly matching the photos in scale and angle
- The computer generated view were superimposed over the photos
- The photos were modified using Photoshop



Saddle Mountain Approvals

- Submitted expression of interest in 1996
- Successfully moved through the approvals process
- Master plan was approved in November 2000
- Master development agreement is currently being negotiated
- Phase One construction summer 2001

Implementation Program

- First Phases are designed to:
 - improve Saddle Mountain for Heli-skiing
 - improve the visual quality of the mountain
 - reduce the number of Down Days
- First lift and Heli-lots in Phase Three
- Lift service to the Summit in Phase Five
- Golf course in Phase Seven
- Nine sequential phases; each phase is a finished product
- Development will be financed by the Mike Wiegele Heli-skiing operation

Benefits to the Resort

- More diverse offering of skiing packages
- Powder skiing academy
- Down Day availability
- Expanded range of facilities
- Improved livability for the staff and the community
- Improved visual quality

Whistler/Blackcomb

Five Year Development Plans

- Visual impact analyses using World Construction Set
- Using Trim data, detailed topographic and planimetric data, air photos and oblique photos

As good as the product is, so far, we are still trying to make sense of the process and make it less cost prohibitive for resort planning projects



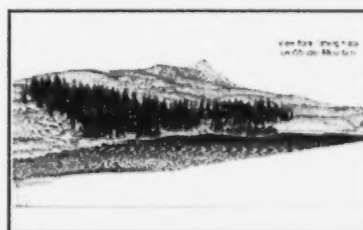
Heli-skiing "Vertical Cutblocks"

Mike Wiegele Heli-skiing

- Digital Terrain Mapping
- Slope analyses to identify skiable terrain
- Work with the local forestry companies to identify areas of mutual interest
- Work together to develop vertical cutblock plans
- Work together on the approvals with the Ministry of Forests
- Economic diversification and sustained prosperity
- Ptarmigan Mountain is currently being cut based on this planning process
- Improved product for both Mike Wiegele Heli-skiing and Weyerhaeuser
- Economic diversification to the region

London Mountain Lodge

- New resort facility in Whistler
- Concerns about the visual impact from Whistler Mountain
- Required a simple visual impact analysis to get the project approved



Conclusions

- Visual impact analysis is playing an increasingly more important role in resort planning
- Utilizing computer technologies is key
- The trick will come in making these technologies as accessible as possible to answer "What if" questions as quickly and economically as possible
- Through consultation and careful planning, a balance between tourism and forestry is being achieved.

Managing Visual Resources Through Partial Cutting

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Good afternoon. It's a great pleasure to be here. I have been working on this conference since last fall and it's great to see everything has come together.

As a speaker I am here today to talk to you today about partial cutting and visual quality, and how our research results suggest that it can reduce impacts on timber supply. As most of you know, forestry is the number one industry in this province and still drives our provincial economy.

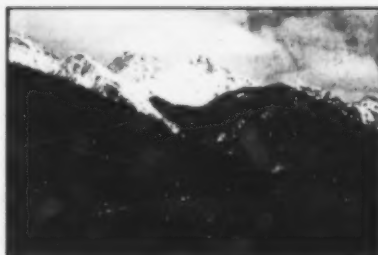
This being said, today's forests are under extreme pressure to deliver more than just timber. Forest managers must also ensure that sensitive species and ecosystems are protected, natural diversity is maintained, water quality and scenic values are not degraded, and the goals of many other forest users are accommodated.

Visual quality of forested landscapes has become an increasingly important issue, as competition intensifies for the limited forest resources in British Columbia.

Tourism, British Columbia's second largest industry, requires spectacular scenery to compete in a highly competitive global market. Within the tourism industry, the eco-tourism and adventure tourism sectors are experiencing rapid growth and require natural and well-managed landscapes for their businesses to succeed.

The Challenge

How do we ensure a vigorous, efficient and world-competitive timber processing industry and yet maintain visual quality for our number two industry? We know that we can manage for scenic values using Visual Quality Objectives and landscape design.



However, it is fact that clearcutting is still the most widely applied silvicultural system in British Columbia. In 1997-98, for instance, 91.6% of the land that was logged in British Columbia was clear-cut. This being said, it is often difficult to meet more restrictive Visual Quality Objectives (VQOs) using this system. Furthermore, the small-scale openings associated with restrictive VQOs usually mean reduced volumes, which ultimately translates into impacts on timber supply.

How can we manage for visual quality and not unduly constrain timber supply? One strategy has been to encourage the use of alternative silvicultural systems. It has been speculated that the public would find the visual result of partial cutting more acceptable. In addition it thought that partial cutting could free up greater volumes of timber from scenic areas in the short term with restrictive Visual Quality Objectives as compared to clear cutting.



The Forest Service undertook three different studies to examine these questions. I am here to discuss these studies and share the results and findings with you.

Visual Impacts of Partial Cutting

The *Visual Impacts of Partial Cutting* report has been published and is available through the Queen's Printer.

Its objectives:

- To determine if there were any site or stand variables that could be used to predict the impacts of partial cutting on the visual quality of a scene.
- To determine the public response to scenes that have been logged using partial cutting.

This was a complex study involving a number of elements and steps, including:

- Collecting pre- and post-harvest field data,
- Photographing sites,
- Classifying the sites' visual quality,
- Analyzing the data,
- Conducting a public perception survey, and
- Analyzing the survey results.

Field work for the study involved collecting pre- and post-harvest site and stand data and taking photographs within the stand and from a distance. After this had been done, provincial landscape experts assigned, for analysis purposes, the landscape level photographs a Visual Quality Class (VQC).

A visual quality class describes an existing level or potential level of visual alteration on the landscape. It is defined by the same criteria as a VQO. There are five classes: Preservation, Retention, Partial Retention, Modification and Maximum Modification. Once photographs had been calibrated, logistic regression analysis was undertaken to determine the relationship between site and stand variables and VQC. This analysis revealed that percent volume and percent stems by average height of residual trees used together were a good predictor of VOC.

Visual Quality Objectives (VQO's) and Associated Management Activities				
PRESERVATION No Activity	RETENTION -Activity not visually evident	PARTIAL RETENTION -Activity subordinate in Landscape	MODIFICATION -Activity dominates but borrows Line & Form	MAXIMUM MODIFICATION -Activity dominates, may be out of scale

A prediction table has been developed so the practitioner can evaluate the visual quality to be expected after partial cutting a stand, given a specific volume removal in a particular tree height class. The values in this table are estimated to have a 90% confidence rating in predicting a VQO, so long as the stand is within the parameters of the study.

Volume Removed (%)	Tree Height (Meters)									
	5	10	15	20	25	30	35	40	45	50
10	R	R	R	R	R	R	R	R	R	R
20	R	R	R	R	R	R	R	R	R	R
30	R	R	R	R	R	R	R	R	R	R
40	R	R	R	R	R	R	R	R	R	R
50	R	R	R	R	R	R	R	R	R	R
60	R	R	R	R	R	R	R	R	R	R
70	R	R	R	R	R	R	R	R	R	R
80	R	R	R	R	R	R	R	R	R	R
90	R	R	R	R	R	R	R	R	R	R

Before I move on, let me share with you a few examples of the partial cuts sampled and the resulting visual quality.

	Location	Forest District	VQO ^a	Tree Ht. (m)	Vol Removed	Stems Removed
14	Goldstream	South Island	R	40	10%	?
15	Skwaam Bay	Kamloops	R	29	46%	?

16	Mt Prevost	South Island	PR	36	60%	51%
17	Cape Horne	Arrow	PR	21	80%	81%
18	Boundary	Clearwater	M	33	83%	93%
19	Scorpion	Arrow	M	23	85%	89%

^a R – retention; PR – partial retention; M – modification



Goldstream

Skwaam
Bay



Mt Prevost



Cape Horne



Boundary



Scorpion

A public perception survey was also carried out as part of this study to determine the public's views with respect to partial cutting.

The public, for the purposes of this study, is defined as a sample of the population that matches the socio-economic profile of the provincial population as a whole.

In general, the sample study was reasonably close to the general population, although participants were somewhat younger (more individuals in the 30–49 age group and fewer over 49), with slightly better education and higher income than for the province as a whole.

We administered a slide show containing 65 slides (36 partial cut scenes, plus 29 clearcut and non-harvest scenes) to 465 people in eight communities across the province. Participants were asked to view and rate the appearance (“visual quality”) of each of the 65 slides as it would affect their enjoyment of it.

During the public perception survey, respondents showed no clear preference for partial cuts over clearcuts in photos classed as Retention.

However, partial cuts were preferred slightly more often than clearcuts in slides with visual classifications of Partial Retention or Modification.

Respondents preferred the appearance of clearcuts over partial cuts in scenes classified as Maximum Modification.

The public response regarding clearcutting and partial cutting was not decisive. The public seemed to respond more to visual quality class than to silvicultural system.

One thing that became very clear is that the public did not like Maximum Modification partial cuts. Other studies have found that people like things neat and orderly.

Moose Creek	Clearwater	MM	30 M	83%	80%
-------------	------------	----	------	-----	-----

- Perhaps Maximum Modification partial cuts look messy and consequently the public dislikes them.



While the *Visual Impacts of Partial Cutting* study identified those attributes we could use to predict visual quality and provided some insight as to the public response, it did not evaluate the implications of partial cutting on timber supply.

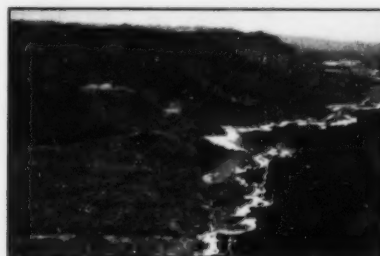
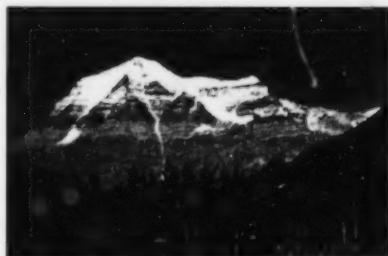
Two Additional Studies

Consequently, two additional studies have been carried out. These are entitled *Evaluation of Merchantable Volume in Areas Subject to VQOs*. One study was carried out in the Robson Valley TSA and a second study was carried out in the Strathcona TSA.

The Robson Valley in central-eastern British Columbia is a good example of an area with high scenic values. The Yellowhead Highway runs through the valley and Mount Robson Provincial Park is a dominant feature.

The Strathcona TSA covers central Vancouver Island, from the south end of Strathcona Park to Brooks Peninsula in the north. The East Coast of the island is extensively populated and the west coast has extremely high scenic values.

The Robson Valley was chosen because it represented the interior of the province, while Strathcona represented the coastal area of the province.



The objective of both studies was to utilize our newly developed volume/stems by tree height table in a timber supply study to determine if any benefits would be accrued by using partial cutting over clearcutting. We did not want this study to be just another number-crunching exercise. We wanted the study to be as thorough as possible and the analysis to be carried out as accurately as possible. Our first task was to determine which stands within each Timber Supply Area (TSA) could be partial cut. A list of criteria was developed after considerable consultation with operational foresters with experience in selective harvesting in other parts of the province.

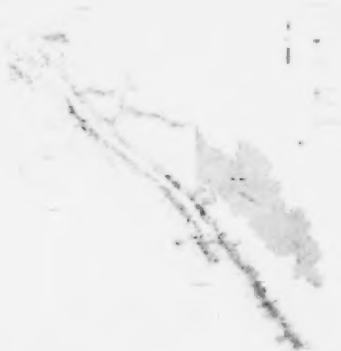
The list for the Robson Valley is shown at right.

This information was entered into a GIS along with the forest cover information and analysed. Ultimately the computer produced a map of those stands suitable for partial cutting based on the criteria submitted.

The identified stands were then run through a timber supply analysis process.

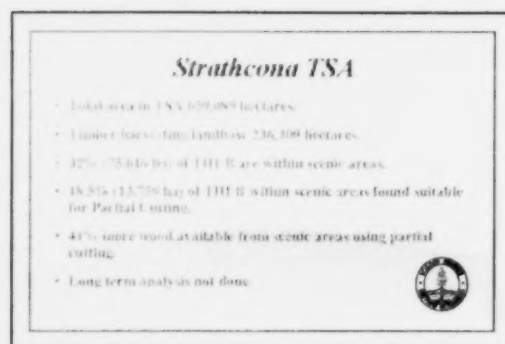
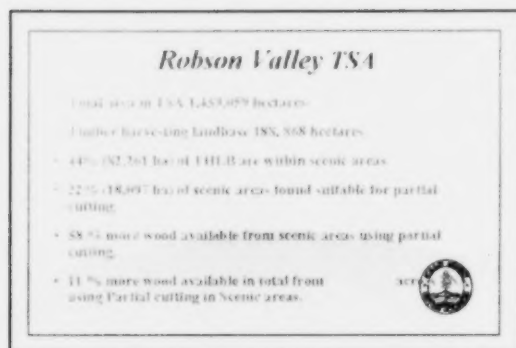
Criteria used to identify stands suitable for Partial Cutting

- Stands that could be ground skidded.
- Stands existing within 100 ft. within the settlement Corridor.
- Stands that were in medium sensitive Carbon Habitat.
- Multilayered Stands.
- High value spruce stands.
- High value Douglas fir stands.
- High value cedar stands.



First the merchantable volume available through clearcutting was derived. Next the volume made available through partial cutting was derived. The difference between these two numbers represented the gain by or loss through partial cutting.

The implications on long-term AAC of partial cutting were determined through a timber supply analysis. The results of the two studies are shown below:



How Is It Possible to Get More Wood Through Partial Cutting?

Partial cutting allows you to make repeated cuts over the whole area in a shorter time, and it doesn't affect the scenic values because you are only taking out a portion of the stand each time.



Furthermore, Forest Practices Code regulations exempt cutblocks harvested by partial cutting from adjacency or green-up requirements where 40% or more of the area to be harvested is retained. That's because the trees remaining after harvesting—or the residual stand structure—will satisfy the green-up requirements.

Given these results, one must ask why are we not doing more partial cutting in scenic areas. There have been a number of reasons:

- Predicting visual results has been difficult.
- The cost to log each cubic metre of wood is higher than for clearcutting.
- Historical emphasis has been timber vs. other resources.
- Equipment and expertise is not readily available.
- Silviculture concerns exist concerning the partial cutting of decadent stands, post-harvest blowdown, and difficulties re-establishing the stand.

Many of these barriers are obsolete, as research and development activities have produced new equipment and methods to implement partial cutting. Increased cost is a reality, but has been a bitter pill to swallow. The Ministry of Forests does will not allow stumpage rates to be adjusted until industry provides hard data showing increased costs. Industry has been reluctant to open their books, not wanting to adjust stumpage allowance without some actual hard data showing the higher costs.

Robson Valley TSA

- Total area in TSA 1,459,059 hectares.
- Timber harvesting landbase 183,368 hectares.
- 44% (62,261 ha) of UHLB are within scenic areas.
- 22% (18,097 ha) of scenic areas found suitable for partial cutting.
- 58 % more wood available from scenic areas using partial cutting.
- 11 % more wood available in total from using Partial cutting in Scenic areas.



Strathcona TSA

- Total area in TSA 659,089 hectares.
- Timber harvesting landbase 236,300 hectares.
- 32% (75,616 ha) of UHLB are within scenic areas.
- 18.5% (11,759 ha) of UHLB within scenic areas found suitable for Partial Cutting.
- 41% more wood available from scenic areas using partial cutting.
- Long term analysis not done.



How Is It Possible to Get More Wood Through Partial Cutting?

Partial cutting allows you to make repeated cuts over the whole area in a shorter time, and it doesn't affect the scenic values because you are only taking out a portion of the stand each time.



Furthermore, Forest Practices Code regulations exempt cutblocks harvested by partial cutting from adjacency or green-up requirements where 40% or more of the area to be harvested is retained. That's because the trees remaining after harvesting—or the residual stand structure—will satisfy the green-up requirements.

Given these results, one must ask why are we not doing more partial cutting in scenic areas. There have been a number of reasons:

- Predicting visual results has been difficult.
- The cost to log each cubic metre of wood is higher than for clearcutting.
- Historical emphasis has been timber vs. other resources.
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It may be that in order to manage for the multiple objectives society wants from our forests, the benefits of partial cutting may outweigh the drawbacks. Partial cutting can result in:

- Less visual impact
- More volume short term
- Elimination of adjacency constraints
- A landscape referred by the public
- Multiple objectives addressed more readily than when using clearcutting.

There is also a new awareness that our forests provide us with far more than just wood products. And this new awareness has led to a different kind of forest management: integrated resource management based on sustainable forest practices. By sustainable, I mean sustainable environmentally, sustainable socially and sustainable economically. Partial cutting is an example of how, with efficient management, we can meet more than one objective on a single piece of land. And in the long term, partial cutting can provide the same amount, or more, timber.



Data-driven Visualization of Forest Management Alternatives Using EnVision

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bmcgaughey@fs.fed.us <http://forsys.cfr.washington.edu>

Outline

- Brief overview of visual simulation and data requirements
- Importance of vegetation data
- Envision overview
- Examples
- 3D digitizing
- Better data

Elements of Visual Simulations

- Terrain
- Surface features
- Cultural features
- Vegetation
- Rendering effects

Data Required For Simulations

- Terrain
 - digital terrain models
 - contour data
- Surface features
 - imagery (Photos or satellite coverage)
 - GIS layers
- Cultural features (roads, buildings, etc)
 - GIS layers
- Vegetation
 - stem mapping
 - measurement of representative plots
 - stand characteristics by polygon
 - attributes of individual plants
- Rendering effects
 - lighting
 - atmospheric effects (clouds, fog, haze)
 - water surfaces
 - camera characteristics

How Do We Generally Represent These Elements?

- Terrain
 - lighted-shaded surfaces
 - texturing
 - bump mapping
- Surface features
 - textured onto terrain surface
 - rendered using primitives
- Cultural features
 - textured onto terrain surface
 - rendered using primitives
- Vegetation
 - rendered using procedural models
 - stems, branches, and needles or leaves
 - rendered using pictures of trees
 - many methods
 - rendered as polygons with texture to represent vegetation
- Rendering effects
 - heuristic light models
 - approximations to the rules of optics and thermal radiation
 - point and object lighting
 - global illumination models
 - ray tracing
 - radiosity methods
 - fog and haze
 - color attenuation based on distance
 - clouds
 - imagery
 - modeled clouds

Elements of Visual Simulations

- Terrain
- Surface features
- Cultural features
- Vegetation
- Rendering effects

Note: Vegetation has the most significant effect on visual simulations (at least in forested areas)

Vegetation

- Significant component of simulations
- Requires large amounts of data to do well
- Easy to misrepresent
- Hard to represent in an unbiased manner

- Hard to manipulate to show changes in conditions

Note: For large areas, general vegetation data may adequately describe conditions to produce simulations. However, when you zoom in to show detail for small areas, generalized data does not contain enough detail (species and size variety, regeneration, understory vegetation).

Types of Vegetation Data

- Artificial... based on ecosystem placement models
 - based on elevation, aspect, soil type, etc.
- Polygon or cell based
 - general description of species composition and size classes
 - inventory or stand exam data
- Individual tree data

How Do You Model and Show Prescription Effects?

- Prescription
 - general statement of desired stand condition
 - may not be enough to drive visualization
- Marking rules
 - specific guidelines to select trees for removal
 - work at an individual tree level
 - even when specified as stand target
 - facilitates data-driven visualization

Note: Difficult to model prescription effects, especially when you only have general vegetation descriptions. More detailed data allows better modeling of treatment effects.

EnVision

- Public domain
- Designed to portray plot, stand, and landscape conditions
- Overall goals:
 - provide a close linkage to data representing areas and individual objects in a scene
 - produce images using a variety of representation methods
 - image draping, simple geometric objects, photo-realistic ground surface and object textures
 - link with existing spatial and vegetation databases

EnVision Features

- Reads data from GIS (shapefiles and databases)
- Renders perspective views that include:
 - terrain
 - surface features using textures on ground surface
 - overlays (polygons, lines, walls, markers)
 - vegetation
 - objects (buildings, powerlines)

- Represents trees using a variety of rendering methods
- Provides ways to represent spatially explicit treatments without “shattering polygons”

EnVision Features

- Developed to address a “scale gap” in existing tools
 - Stand Visualization System (SVS): <1 to 5 ha
 - UTOOLS/UVIEW 500+ ha
- Rendering via OpenGL
- English or metric units or combinations

Note: Very few tools like EnVision exist. EnVision uses data typically stored in forestry GIS databases. EnVision produces images that range from simple abstractions to near photo-realistic renderings.

Basic Data Needs

- Terrain model
- Stand polygons
- Stand data
 - inventory (per acre/ha stand table)
 - SVS file for each stand

Note: Other data can be incorporated depending on the user's needs.

Draped Polygon and Line Overlay



Note: GIS polygon overlay with colors based on stand structure classification scheme.

Polygon Overlay with Textures



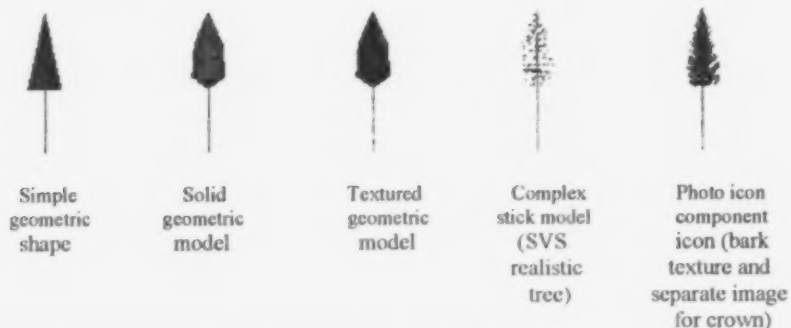
Note: Textures clipped from aerial photograph used to fill polygons. The resulting “synthetic image” is draped over the terrain model.

Stand Data

- Inventory data
 - stand identifier, species, dbh, height, crown ratio, expansion factor
 - ASCII text file
 - DBASE format database file
 - SVS stand file for each polygon
 - Stand area doesn't matter (1 acre/ha typical, larger or smaller OK)
 - Stand file will be used to fill stand polygon with optional rotation and mirroring to minimize pattern artifacts

Note: Inventory data can be measured tree records from a detailed inventory or diameter class tables for each species. Working with SVS stand files allows better representation of harvest patterns. Especially those that involve partial retention where retained trees are clumped. When using inventory data, harvest patterns must be developed by changing the stand polygon layer and assigning appropriate vegetation data to the treated and untreated portions of the original stand.

Tree Rendering Methods



Note: EnVision provides a variety of methods for rendering individual trees.

Examples

- Retention level and harvest pattern alternatives
- Mechanical fuel reduction treatments
- Stand development
- Inventory driven simulations

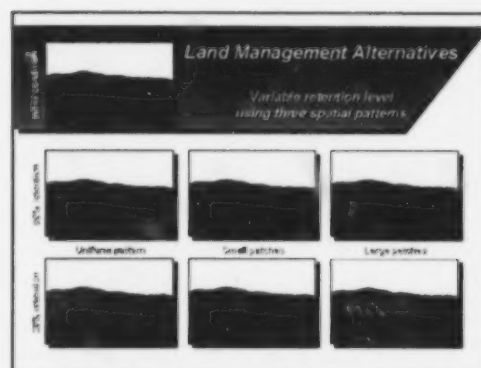
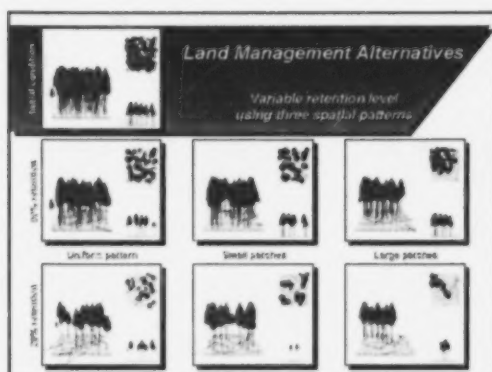
Retention Level and Harvest Pattern Alternatives

- Vary the retention level
 - base retention on basal area
 - apply treatment proportionally across diameter classes
- Vary the spatial pattern
 - Evenly distributed retention
 - Leave small patches (several per acre)
 - Leave one large patch per acre

Modeling Stand Treatments

- Initial stand condition based on inventory
- Treatments simulated using the Stand Visualization System (SVS) and a one-acre stand plot
- SVS plot used to fill polygon in EnVision
- Untreated portions of the landscape are populated using the untreated stand

Note: All treatments were modeled on a 1-acre plot using the Stand Visualization System



Note: Treatments that remove less than 50% of the basal area do not change the appearance of the stand very much.

Mechanical Fuel Reduction Treatments



Pre-treatment:

- 32 tons/acre down logs 3" and larger
- Lots of standing dead trees



Post-treatment:

- 10 tons/acre down logs 3" and larger
- All standing dead trees removed
- Regeneration reduced by equipment activity

Note: Fuel reduction treatments from Blue Mountains in Oregon. Goal was to show the effect of mechanical fuel removal. Mortality due to bark beetle damage and overstocked conditions. Very high pre-treatment fuel loadings

Stand Development

Treatment designed to create a two-aged stand

- Initial cut resembles a shelterwood leaving less than 20% of "full" stocking
- Some underplanting to encourage Douglas-fir in understory
- End goal is Douglas-fir overstory with hemlock-cedar understory



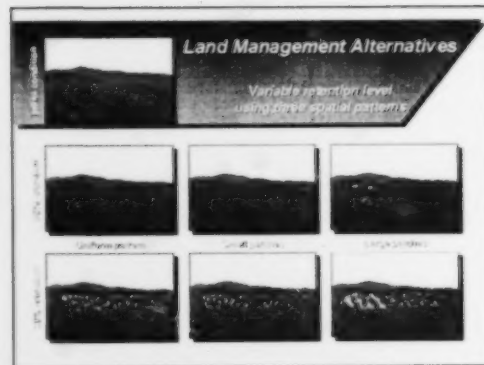
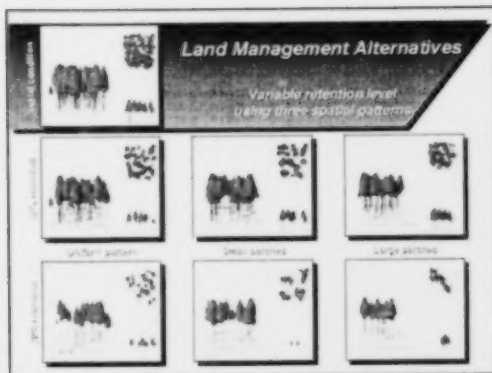
Immediately after treatment



30 years after treatment



75 years after treatment



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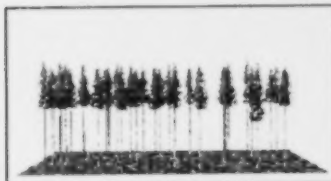
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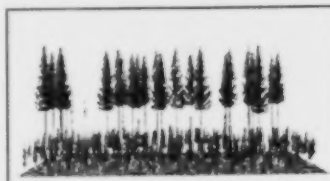
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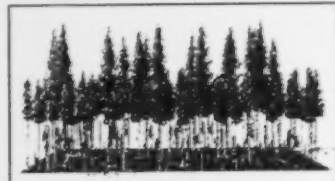
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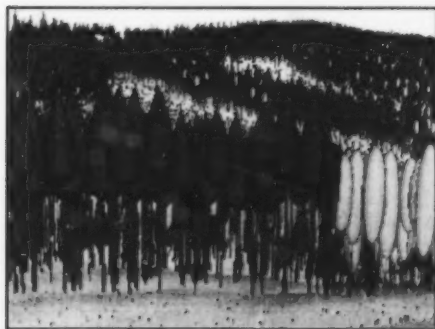


75 years after treatment

Using Forest Inventory Data

- Stands delineated from aerial photos
- Inventory designed to characterize conditions in every stand polygon
- Inventory data consist of one record per measured tree
 - 2,700 ha area... 13,500 tree records
 - for each tree record: stand identifier, species, dbh, height, crown ratio, expansion factor
 - tree expansion factor based on inventory plot size

Ground Surface and Simple Trees

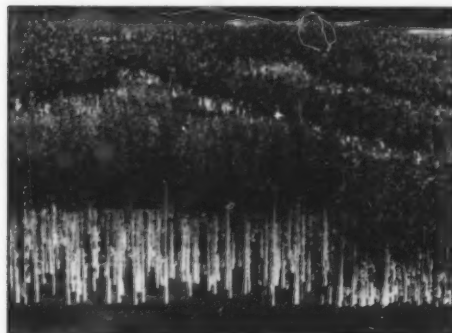


Note: Tree species, size, and density from inventory data
Tree locations are generated
Trees represented using solid models that accurately reflect the inventory data

Comparison to photograph



Textured Ground and Photo-Trees



Note: Tree species, size and density from inventory data, trees represented using photo-derived tree icons. No additional data is added to support the higher level of realism. Rendered scene is more realistic but doesn't necessarily match reality

Comparison to photograph



The big question is... Which rendering method best communicates the data?

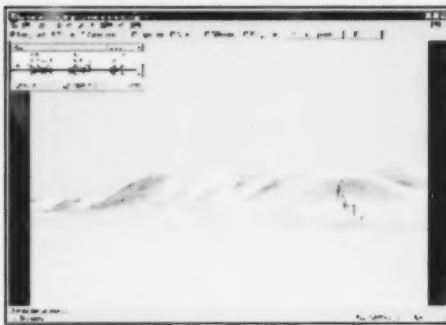
The question should not be "which image looks most real?"

Digitizing On Perspective Views

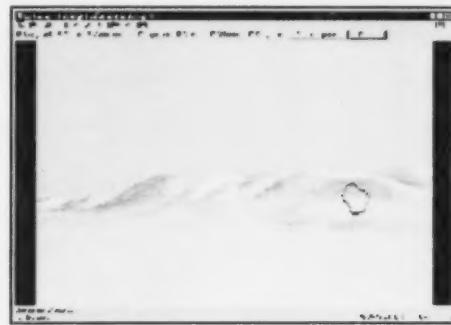
- EnVision allows you to digitize features from the perspective view
- Features can be saved as ARC/INFO generate files (points, lines, polygons)

Note: Points are displayed using X, Y, and elevation as you move the mouse. Selecting a point, saves the point and draws a point marker in the scene. Features can be saved in formats suitable for input to GIS.

Digitizing on Perspective Views



Digitizing on Perspective Views



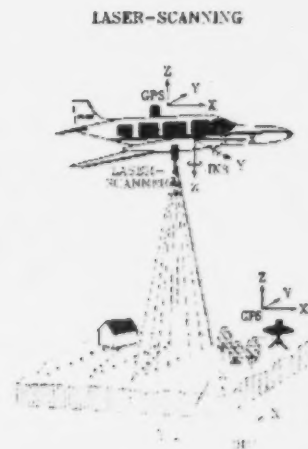
Better Data = Better Simulations

- LIDAR technologies are providing better terrain data
- Same technologies may provide vegetation data
 - overstory characteristics
 - maybe overstory tree locations and attributes

LIDAR (Light Detection And Ranging)

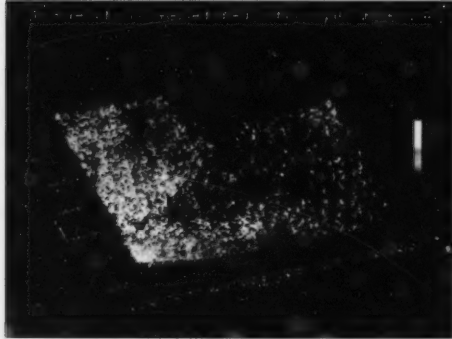
- active airborne sensor emits several thousand laser pulses per second
- many sensors can record multiple returns from a single laser pulse
- recorded pulse returns are post-processed and delivered as X-Y-Z coordinates

Light detection and ranging (LIDAR) shows tremendous promise for creating data for use in visualization (and other

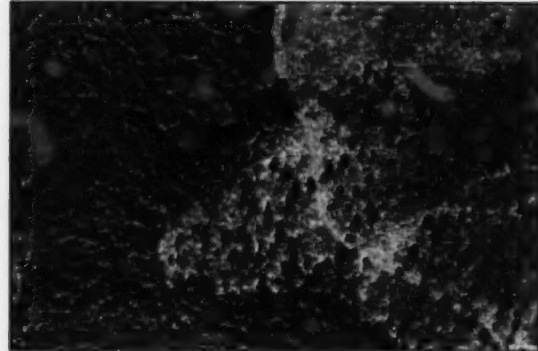


LIDAR Returns Colored by Elevation

(~1km wide by 2km tall)



Comparison to aerial photo



Note: Small section of raw return data colored by elevation. Blue points generally represent the ground surface.

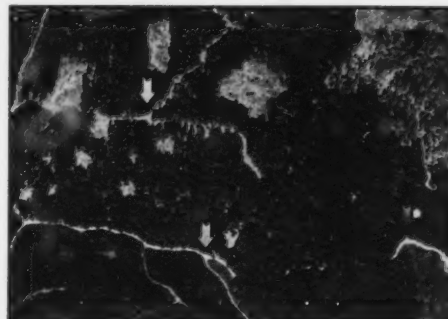
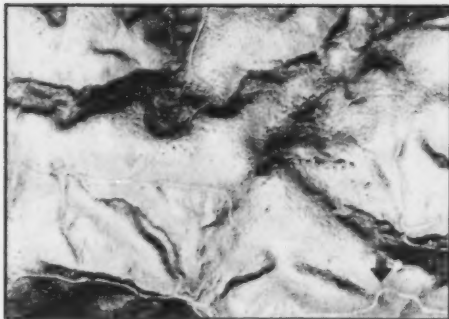
Very Accurate Ground Surfaces

- LIDAR returns processed to produce ground surface with 5 foot cells

Note: This is the ground surface (different area from previous slides) extracted from the return data.



LIDAR Penetrates Canopy (usually)



Note: Important thing to remember...LIDAR penetrates canopy in all but the heaviest cover. Photo shows the area when the LIDAR data were collected...arrows highlight common features

For More Information

- Web site: <http://www.fs.fed.us/pnw/envision>

Visual Resource Management: Thinking About the Future, and Thinking About Edges.

Professor Alan G. McQuillan

Professor of Forestry Management, School of Forestry

University of Montana, Missoula, MT 59801

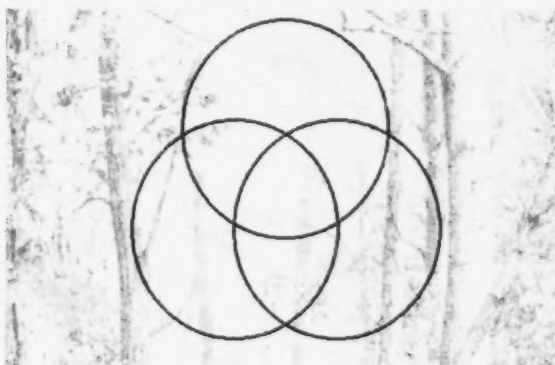
Phone: (406) 243-4973 Fax: (406) 543-3652 E-mail: amcq@forestry.umt.edu

In recent decades we have learned how to manage forests while maintaining habitat for wildlife species, but what about the human species? When wildlife biologists study the mating habits of birds, they sometimes draw conclusions about attractive and colorful tail feathers and mating success – and call that science. So, we should not call it *voodoo science* when we discover that the human species has certain habitat requirements also – requirements that include retaining nature's beauty, often expressed through the political process.

I shall draw on the remarks made by the other speakers and include some thoughts of my own, especially with regard to consideration of edges in seeking to emulate natural disturbance patterns in ways that are *naturalistic* in appearance.

As Stephen Sheppard indicated we have to seek the common ground that exists between, as he put it, what makes the public happy and what makes ecologists happy. Despite the fears of some ecologists, there must surely be considerable overlap – after all, we cannot really imagine that so-called pre-settlement conditions were actually ugly can we? Of course, some natural events are ugly in the short run, or even for decades if the disturbance is catastrophic. But, as Steve McCool indicated, there can be considerable difference between what is natural and what is naturalistic. We are not likely to get away with simulating natural catastrophes, no matter how realistic. Burton Litton spoke about “ephemeral landscapes” in reference to things that change quickly, like sunsets, but of course nature is always changing; it is all a matter of scale. Some changes are faster than others. Eventually we can expect another ice-age, and in just over 4 billion years, astronomers expect the earth to disappear with the end of our sun. It is perhaps true that the public are not accustomed to seeing ecological change over a few years or decades – which is where the role for ecological education comes in. Hamish Kimmins has a good idea in suggesting simulated time-lapse movies to show how ecosystems change – and to show how ecosystems respond favorably to disturbance. Thus, we might hope that the public will come to accept visually unattractive disturbance if it brings about attractive and ecologically-sustainable changes within say 5 or 10 years (but not 50 or 100 years, which is beyond most people's lifetimes). After all, people already accept the bandages that go along with plastic surgery, or the appearance of their dog after its annual haircut!

This venn diagram of three overlapping circles suggests how we must manage at the intersection of what is visually



acceptable, what is ecologically sustainable, *and* what is economically feasible.

This Scottish environmentalist brochure complains, not about the tree-less landscape, but about the re-afforestation! As Oliver Lucas pointed out, things are sometimes reversed in Britain. But the general complaint is the same everywhere – the straight lines. As William Kent said over 200 years ago, “nature abhors a straight line.” And that is one thing that VQO managers and ecologists can surely agree on. *There is no ecological principle that says we must manage in straight lines or with square corners!*



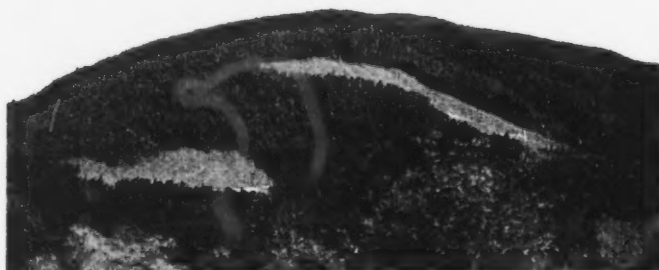
The BC visual design manual adopts the methods laid out by Oliver Lucas and his colleagues, and it does a superb job of matching overall shape to terrain at the landscape scale. . .



Although it can lead to something like a jigsaw puzzle effect (from Oliver Lucas' book *The Design of Forest Landscapes*) . . .



As, for example, here on Vancouver Island (near Port Renfrew). Although these blocks have shapes that match the terrain, they do not look natural because of their clean edges.



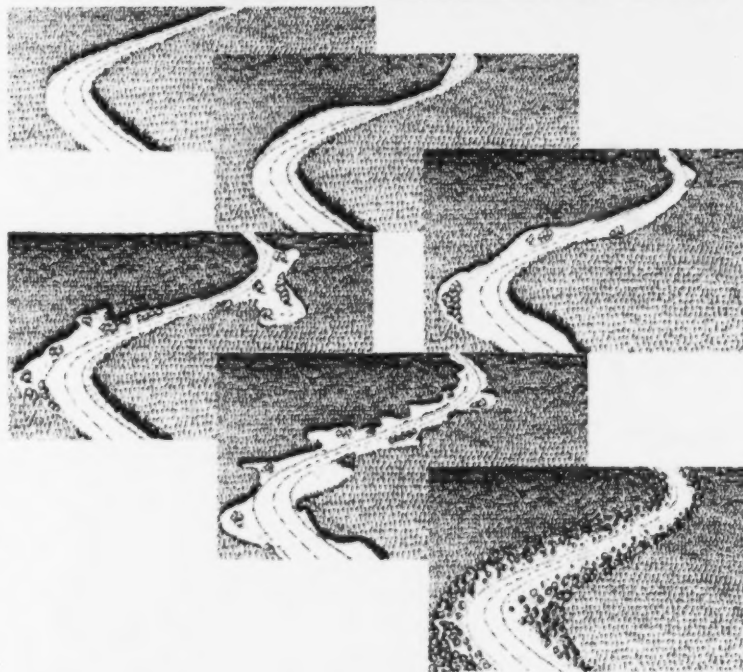
We need to acknowledge that nature does not create openings in the same way that a child cuts out paper shapes with scissors. Natural openings seldom have clean edges. Edges tend to be fuzzy, with wiggly lines. And trees exist in the openings – not evenly spaced, but in clumps of different shapes and sizes. Besides looking good, these kind of openings offer edge for different species of wildlife at multiple scales.



These edges are best described as fractal -- meaning that, if we zoom in on them, we see still more edge and more openings and more clumps at smaller scales. Fractal edges are complex in terms of pattern.



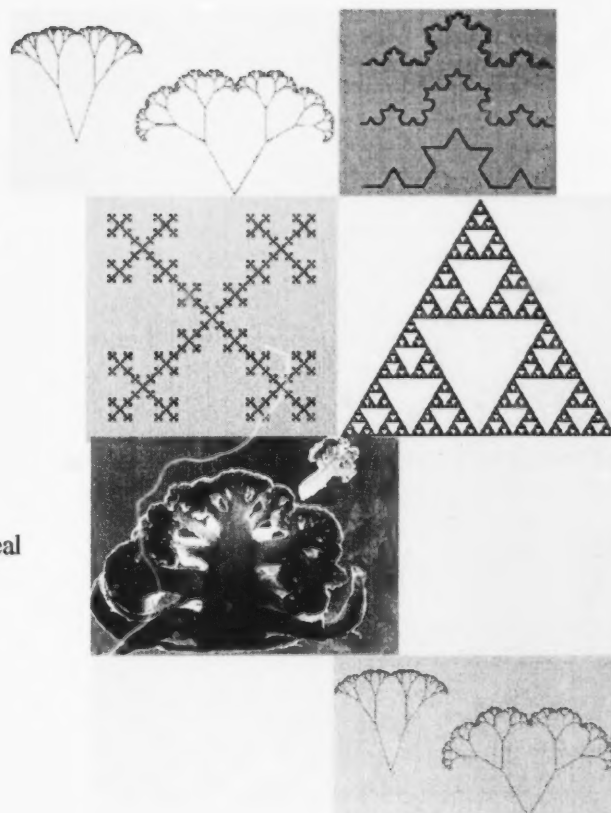
This illustration is from Oliver's book. In designing or leaving corridors, he recommends the appearance of the fuzzy edges at bottom right in preference to the clean edges at top left. The fuzzy edge is fractal, and the ecologist Richard Forman has suggested that these fractal edges have ecological advantages in term of wind firmness. The fractal edge dissipates wind energy without causing as much damage to standing trees.



Fractal dimension is something that can be measured – as here with the coast of Norway. Although there is no stable answer to the question “what is the length of the coastline?” (it depends on the step-length chosen), there is a stable answer regarding its fractal dimension – which is a measure of its *complexity*, or wiggleness if you prefer.



You have probably seen pictures of theoretically-perfect fractals – in books that have become popular in the last 10-15 years. . .

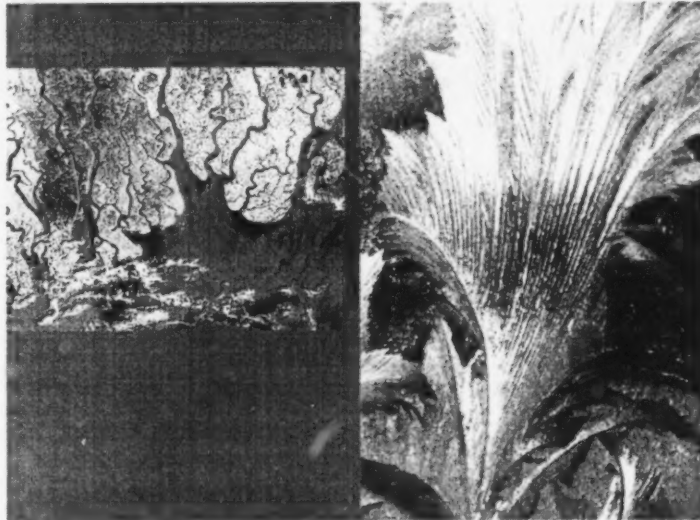


And explanations of how they relate to real organic things – like cauliflower. . .

At many different scales – from river deltas seen from satellites (here the Ganges River) to frost on the windowpane.

The important thing about real fractal objects is that they contain random elements. No two are ever alike, even though the objects can be *named* (because we recognize their distinctive patterns). Snowflakes for example.

Oliver listed 6 principles of design for simulating naturalistic forests, and two of these were diversity and unity. These might sound like contradictions, but they are not – just as snowflake patterns have an essential unity even though no two are alike. Diversity is the opposite of monotony.



In 1725, the Scots philosopher Francis Hutcheson wrote a treatise on “An Inquiry into the Origin of Our Ideas of Beauty” in which he said that we find things beautiful to the extent we find “uniformity amidst variety.” The more the variety, he held, the more the beauty – as long as we still discern some linking unity – as long as things still ‘hang together’ as we might say today.

It was Hutcheson, too, who first wrote about beauty being in the eye of the beholder – and in so doing he created a lot of misunderstanding that persists today. He did not mean by this that beauty is entirely arbitrary or esoteric (like one man’s meat being another’s poison – another aphorism that is frequently wrong, poison after all *kills*). As his writing makes clear, Hutcheson meant that “Beauty is not any quality that is supposed to be *in* any object, *without* relation to any mind that perceives it.” Thus, beauty is not an independently-real thing (like lungs, or a heart, or death), but is a perception of the human mind brought about by seeing (or otherwise sensing) the object considered beautiful – hence *in* the eye of the beholder. But, he and his successors (like Kant) went on to show that the perception of beauty is often predictable, stable, and widely-shared – people generally like roses, for example, even though some might not like certain colors, etc.

Many recent psychologists and their like (like Stephen Pinker, the Kaplans, etc.) have shown the extent to which our aesthetic sense is deeply psychological – and Roger Ullrich’s work relates to this. Stability of aesthetic judgment generally supports the theory of socio-biology as propounded by ecologist E.O. Wilson. This theory holds that our sense of beauty (and morality too, following Hutcheson) is an evolved human characteristic – something that has aided humans over millennia in our struggle for survival in hostile environments. Bob Ribe has written that the results of perception surveys (regarding nature) are often not very surprising, being just what you would expect intuitively. This makes sense when we realize that our aesthetic sense – in terms of choice of places to live, things to eat, the partners we choose, etc., etc. – must in general be ‘good

for us' or we would not have survived to this point in time. We simply wouldn't be here. On this basis, things like 'anorexic aesthetics,' for example, must be a relatively short-term aberration.

Oliver mentioned Jay Appleton's "prospect refuge theory" which supports our claim: Given that, for 99 percent of the human species' existence we have been hunter-gatherers (E.O. Wilson), it is hardly surprising that we find attractive those *edges* that combine good hunting prospects with good refuge for ourselves and our families.

Let's look at some edges – this is an area burned in the Bitterroot fires of last summer (in Montana).



By playing with Photoshop®, we can bring the burned trees back to life and see the fractal pattern of the pre-burn timber – adapted to the terrain and geology, but with random elements.



If we highlight just the burned trees, we see they have a similar fractal pattern. . .



As do the unburned trees (although harder to see). The fractal pattern of the timber is essentially unchanged by the fire. This is typically the case where we have a fire-adapted ecosystem for the simple reason that the prevailing patterns reflect the occurrence of fire in the first instance (e.g. Glacier National Park, Montana). If we want to mimic natural disturbance, therefore, we should mimic these kinds of fractal patterns.



Fire doesn't advance in straight lines.



It usually has a wiggly, fractal front.



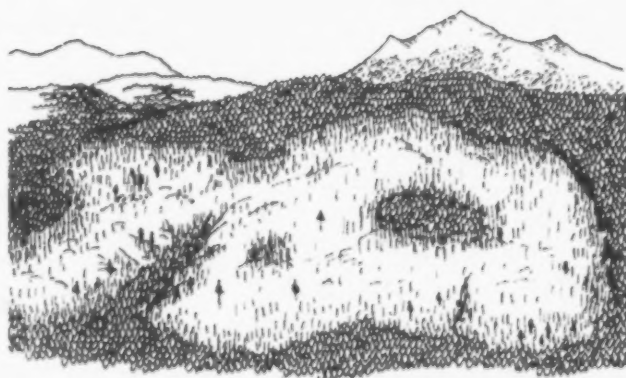
And fires go out, they typically
leave wiggly edges,



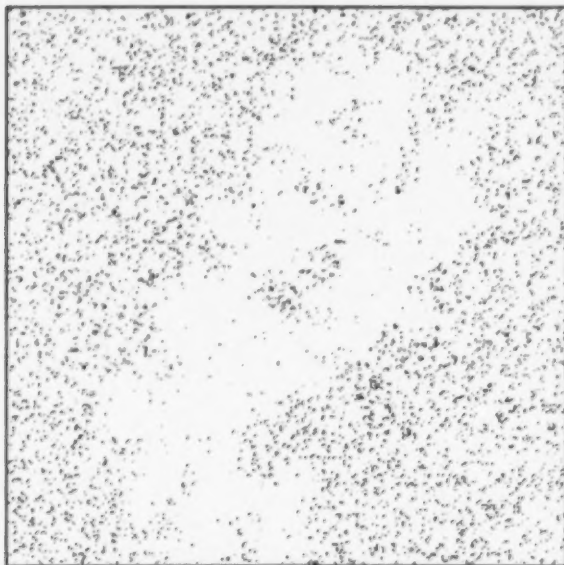
And uneven clumps and patches of
unburned trees at multiple scales.



These patterns can be difficult to
invent by sketching -- because
people find randomness rather
difficult to invent. The results often
don't look quite natural enough
(from Simon Bell's book
Landscape).



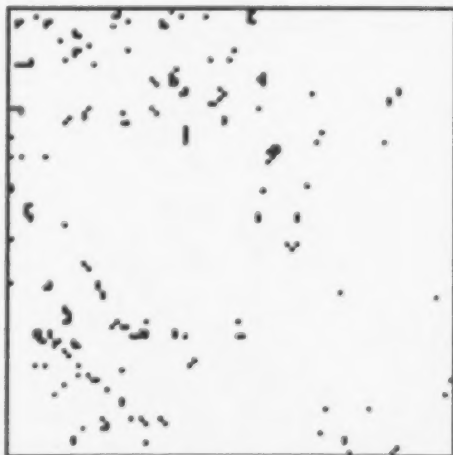
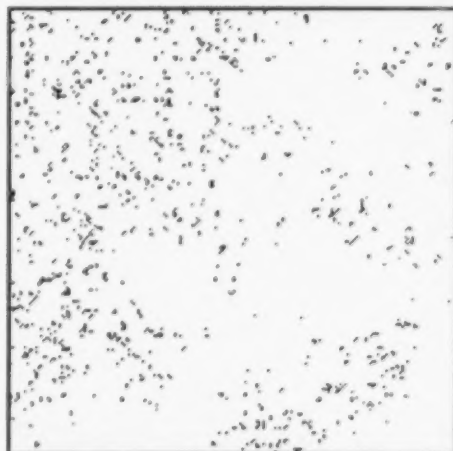
But we can simulate them using simple computerized stochastic processes. These simulated fires are fractal – meaning that, if we zoom in,



We see more of the same pattern at a finer scale. . .

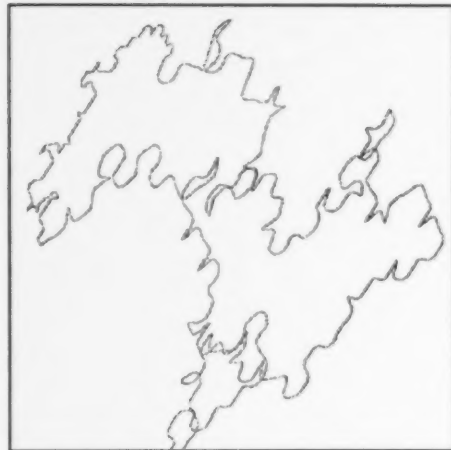
And more edges and smaller openings (like bays within bays on a coastline).

A few years back, when we were building our house, we wanted a Mexican-tiled dining-room floor with a mixture of one reddish tile for every three yellow-ochre tiles, and we wanted the reddish tiles spaced in a random pattern. We knew that if we tried to do this manually, it would likely look too regular, so I used the computer to produce 25 alternative layouts that were truly random. We selected the one we liked best, and asked the tile-layer to “just do it” exactly as the plan showed. He was skeptical at first, but he liked the results so well that he took several photos to show other clients! In a similar way, statisticians have used this phenomenon to catch embezzlers – no one making up phony financial data would ever put down seven sevens in a row, for example. Since such weird combinations do actually happen, and with known probability, experts have used the *absence* of this kind of numerical clumping to screen financial data and identify suspected crooks!

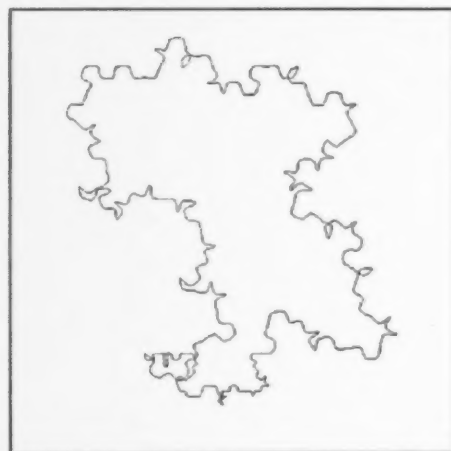


If we want to mimic natural fractal patterns with random elements, therefore, we might find computer simulations useful.

We don't need very sophisticated computers or mathematics – a simple routine in Excel®, for example, can draw natural shapes to order.

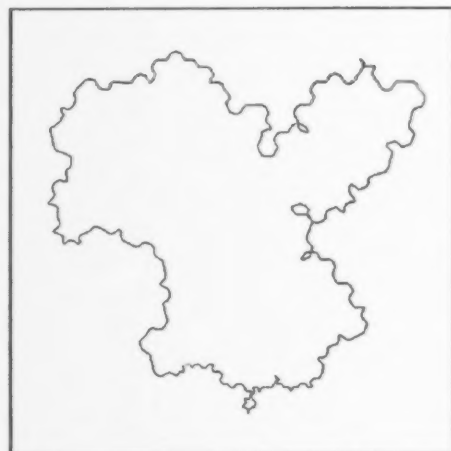


We can specify that we want the line to go through certain points (here four), *and* the degree of wiggleness (fractal dimension). Here more wiggly, and below, less so.



And we can easily feed these coordinates to a GPS as a set of 'way points.' Foresters who have tried to mark cutting blocks with feathered edges in the past have often found that, on the ground it is hard to "see the forest for the trees." With a GPS and this kind of routine, it is no longer difficult.

I believe we can use clearcutting to mimic even rather large natural disturbance patterns. And, if we adapt cut-block shape to the terrain (after Oliver's principles, using "lines of force" analysis), *and* "fuzz up" the edges naturalistically, *and* leave similarly-fractal clumps of uncut trees in the interior, then the results should be, not only aesthetically-acceptable and naturalistic, but also perhaps even desirable from wildlife and silvicultural perspectives.



To wrap up: we can hopefully educate the public about ecological change, but we cannot hope to change some fundamental things about our naturally-evolved aesthetic sensibility. This is a photograph by Christopher Burkett. He sells very large Cibachrome photographs like these for high prices in art and photography galleries (e.g. Photographic Image Gallery, Portland, OR). Ecologists might say these trees look overcrowded, but surely few would deny that the scene is beautiful.



Foresters and ecologists sometimes worry about people not liking messiness in the forest, but I know of no political pressure group of environmentalists that is campaigning to clean up the messiness of old-growth forests, or the messiness of wilderness areas. People do not object to messiness *per se*. As Sheppard and McCool both point out, people object to messiness when it was created by people who apparently *simply did not care*. If ecological health calls for a degree of messiness in the woods, then it should appear naturalistic. To the extent that it must appear artificial (which should be minimal), then, as Joan Nassauer has written, people should be given "cues to care" – explanations of why things are the way they are, for ecological reasons.

Above all, we need to overcome the notion – held by many foresters as well as the general public – that forest management is inherently ugly. It doesn't have to be that way. And, if forestry is to be publicly acceptable (as it must be, if forestry is to endure), then we must demonstrate by our practice that the managed forest can *appear* natural. The first step is to heed William Kent's observation that "nature abhors a straight line," and I would add that the next step – the direction for the future – is to observe that nature's wiggleness occurs at all scales. In other words, natural wiggleness is fractal.

The Use of Silvicultural Systems to Meet Visual Quality Objectives

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Today, I'm going to talk about the small community of Bralorne and the Visual Management work we did.

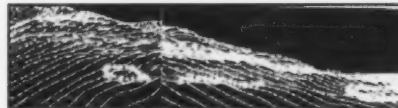
Downtown Bralorne ca. 1990

- Logging in the face of a community
- Contraversial
- Visual Management to the forefront



First Thoughts (ca. 1990)

The early technology
"design techniques" = awkward



Enterprise Creek

- Solution needed
- Enterprise Creek.
- Highly visible along Highway to Whistler
- Just outside of Lillooet 5 minutes



Narrow Yarding Corridor

- First Time
- Narrow Corridors
- Lateral Yarding
- Makki II



MoF Field Trip

- Understanding the Operational side of Partial Cutting
- Build trust with MoF
- Common goal to meet VQO

Uniform Shelterwood

- Logger ingenuity required.
- No field layout/ guidance for corridors
- Trees had to be left evenly distributed.
- View with logging completed
- Corridors accented by snow
- Lateral yarding was limited
- Difficult to pulling the trees around standing timber towards the yarding road
- Corridors repeating themselves 60 to 80m
- Moving along the highway, the corridors become invisible
- Initial 50% removal
- Unsafe falling and yarding (WCB)
- Increased to 60%
- No impact to the visuals.



Road & Landing Screening

- Visual strategy = screen roads and landings
- Landing located along a terrain break
- Viewed obliquely from the highway,
- This road system and landing not visible
- Herman Dirks self loader
- Bill Qually WestCoast Falcon Yarder



Uniform Shelterwood & Clearcut - Aerial View

- Expanding our view out
- Snow covered conditions
- Extent of our operations in Enterprise over 20 years
- Lower clearcut areas = Armillaria root rot
- Upper clearcut = not visible
- Notice the Greened-up area



20 Year Old Douglas-fir Forest

- That Clearcut area
- Regen Performance = best in our area.
- Kevin Raynes is next to a 20 year old Douglas-fir forest.
- The mean annual increment is estimated to be 1/8 of an inch/ year.



Regen Comparison

- Clearcut in foreground
- Uniform Shelterwood in the background
- Both logged at the same time
- Significant difference in regen performance
- Santok Atwall - Plant Committee



Clearcut vs Shelterwood

Clearcut

- Ecologically Suitable
- Excellent leader & diameter growth
- Excellent densities
- Achieves "Visual" green-up rapidly

Shelterwood

- Intense moisture competition
- Poor leader growth
- Lower densities
- Long time for Visual green-up

Example:



Clearcut

- 4 year old larch seedling
- 10 feet

Shelterwood

- 3 year old pine seedling
- 1 foot

Second Pass???

- How are you going to log the remaining trees without wiping out the understory
- Can't be done economically.
- Helicopter logging in a cable area
- Future... "designer clearcuts"
- While the regen is small = minimize the long term losses

Strip Shelterwood

- Further up the Duffey Lake Highway
- This area is not visible.
- "Long-line" yarding technique introduced
- Converted "Helicopter" wood into "Cable" wood.
- A cost saving of approximately \$15/m³

Limitations

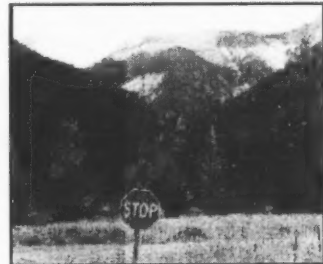
- 2800 feet to 2000
- 2 intermediates to 1

Area previously logged in 1988: 3 Clearcuts
1 shelterwood



Rec Site View - Pre Logging

- First test of long-line in Visible area.
- View from Roger's Creek MoF Rec Site
- Prior to Harvest



Modified Madill 071

- Machine doing our partial cutting



Yarding

- Bringing in a turn
- Clearcuts in the background
- A valuable lesson was learned.
- Too steep and too dangerous for traditional partial cutting
- The fallers = envisioned a R/W width
- Good for visuals
- Good for ecology = shading a dry site
- Excellent deflection is over fish bearing streams.



Narrow Yarding Corridor

- Looking straight down to the landing
- Downhill yarding is difficult
- Skinned up trees
- Start = 6 meters wide
- End = 10 meters wide
- Max lateral distance 50 meters



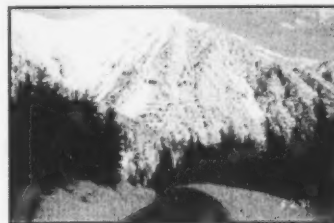
MoF Field Trip

- MoF field trip to show operation
- The center yarding road is the previous slides perspective
- 80% completed



Contour Shelterwood

- Driving eastbound
- Visible short duration
- Not spend money on simulations
- Clearcut = geometric, I'd like to have back.
- Mental slip = small impact
- High absorption, orientation is natural to surroundings



Clearcut & Shelterwood

- 70% removal
- Second Pass concept
- Minimizes impact to advanced regen

Contour Shelterwood

- Same concept = amphitheater like area
- Prior to harvest



Contour Shelterwood

- Taken this past winter = same location.
- Logging is complete
- Photo under the worst conditions of snow and front lighting
- Long-line and Helicopter yarding used



Contour Shelterwood -Aerial View

- Aerial view
- Also small clearcuts in back



Seed Tree

- Another Seed Tree
- Not located in a visual area
- Yarding Engineers Perspective

Costs:

- Average \$5/ m³ more than a clearcut
- 12 ha Block
- 400m³/ ha
- \$30,000 extra cost to partial cut
- More than 95% volume harvested
- Re-threading of lines and changing of yarding roads is costly due to lost production.



Partial Cutting Hazard

- The same block
- These trees blew over while the logging crew was there
- Safety always has to be on the mind when partial cutting



Seed Tree - Aerial View

- More than enough visual diversity and texture
- Irregular boundary and leave trees
- Solution = Clump the seed trees versus uniform retention
- Safer and more beneficial to wildlife



Hoe Chuck

- Hoe chuck compatible with clear cut or seed tree
- Clumping of residuals would also increase productivity
- Reduce costs by "day lighting" to the landing.
- In steeper ground, "buddy up" and hand off the wood
- Reduced site disturbance



Public Relations

- We developed Gun Lake
- The long process of building up trust began.
- Many field trips before a single road was built or tree felled
- Being up front with all the issues.
 - Ministry of Forests
 - Ministry of Environment
 - Gun Lake Ratepayers Association
- Getting everyone to the logging site was key
- Understanding and appreciating the efforts we were going through to meet their needs.

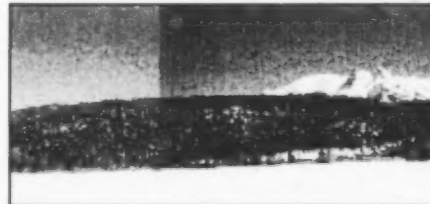


Narrow Yarding Corridor

- Our experience payed off
- Lateral yarding to narrow corridors again

Logging Completed – Uneven-aged Selection

- Mt Zola from the highway perspective.
- An interesting point on this slide,
- The permit only covers the upper portion of what is shown.
- The lower areas are naturally open due to the mountain pine beetle activities.
- Barely visible is one of the yarding corridors
- Just visible were two yarding corridors.
- Our impression of the permit on Mt Zola was that we did not log enough
- Cautious = wanted to prove we could do it
- Worst conditions of snow cover with front lighting.
- Again, no visible impact and we could have logged more
- Good Behavior = Second Cutting Permit
- North side of the lake = cutting permit 180



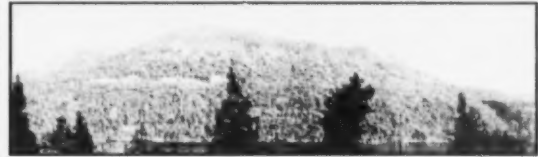
Cut-to-length Selection

- Mechanically harvested with a cut-to-length
- Safer than hand falling
- More productive
- Protection of advanced regen
- The CTL equipment - Jim Kopytko
- Uneven-aged management



Gun Lake North Pre & Post

- Only negative feedback from the Public
- When modelled, the block showed more distinct openings versus the final results.
- I personally am satisfied with the results.
- We "agreed to disagree" on this one.



Landscape Design Manual

"In this landscape the slope plunges straight down into the water. Apart from extremely short range views the whole slope is constantly visible. As a result a foreground strip is of no use. The whole mountainside must be designed."

- For the keeners in the crowd - Gun Lake is not new...
- MoF Landscape Design Training Manual.
- 20 years ago? red trees in the midground.

Completed Cutting Permit

- Here's what we did with it...
- 5 blocks
- 33,000 m3

Noel Creek Pre & Post

- Back to Bralorne...

Noel Creek

- First Permit = Low Risk = Least Visible
- Pre-logging Picture = 1990
- Conventional clearcut operations
- No increased logging costs linked to visual management.
- Private land = completely blows good visual management
- Second Permit = highlighted area



Clearcut

- 168-17
- Cross stream yarding of Noel Creek
- Yarding good for upper 2/3
- Reserve in way for bottom 1/3 = narrow corridors utilized again
- Reserve for Terrain Stability



Upper (Bradian) Viewpoint

- Notice the natural opening



Cutting Permit 168

- Technology had a chance to catch up.
- Several small blocks with different Silvicultural Systems
- Three options to the Public
- Determined how the third permit was to be done



Pre & Post Logging Map - Third permit

- Appraisal Map versus Actual logged Map
- Smoother edges
- More intermediates used

DEVELOPMENT COSTS:

- Roughly \$1,000/ ha additional (bush ribbons) due to very complicated terrain and highly visible



11 Intermediates



15 Intermediates

Owner & Operator

Owner/ operator - Kelly Beattie, Hillside Harvesting

The carriage:

- ACME motorized slack pulling carriage
- Approx 1700 lbs
- Approx 300 feet/ min

Tail Spar

- Mobile backspar = cost saver
- Reduces the rigging up time between yarding roads
- Always lots of rigging in a partial cut, good place to reduce time spent



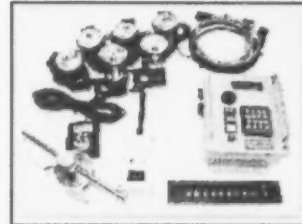
Rigging

- Tough work.
- No one's happier about a motorized carriage than these folks: Jeff Pfeiffer, Kyle Vannuys



Electronic Chokers

- Electronic chokers pay for themselves shortly
- Increased safety around the landing and higher production
- Approx. \$18,000 for the whole set-up.
- Increases productivity
- This can't be done with a running skyline



Yarding

- Bringing in a turn.



Intermediate Tree - "Jack"

- "Jack"



Landing

- Electronic Chokers:
- Allow smaller landings
- Partial cutting will require multiple set-ups.
- Benefits visuals,
- Reduce road building costs
- Less site disturbance.
- Yarder and loader work side by side
- Good productivity = 4 to 5 loads/ day



"Skid" - Gary Ens (Trucker)
Chris Moffat (Loader man)
Albert Fredericks (Yarding Engineer)

Intermediate Tree

- Downtown Bralorne in the back



Wide Corridor

- The same intermediate.
- Learned = placement of I-trees
- Wider = Armillaria root rot
- Something we didn't do enough of in Enterprise



Narrow Corridor

- Another narrow yarding corridor
- No intermediate

Using the Terrain

- DRY DRAW
- Small terrain features to maximize your yarding
- Minimize disturbance
- Best visual impact results
- Don't find from an air photo or map.
- Again, the field work up front is key



Clearcut Bench

- Clearcut located on the bench below
- Hoe-chucked

Strip Shelterwood - First Half = Corridors

- Base = clearcut portion
- Strip shelterwood



Strip Shelterwood - Second Half = Clearcut Contours

- What the contour clearcuts look like
- Lateral Deflection required
- Small ridges require a corridor on either side



Bralorne Summary

The Bralorne Stats:

- 10 years from planning to planting
- Three cutting permits (TCP - Dave Bedford)
- 23 Blocks
- Total of approx 78,000 m³
- Average block size is 8.6 ha
- Average volume per block approx. 3,400m³.
- Ranged between 300 to 500 m³/ha



Parting Thoughts

- Do your homework...consider the next pass.
- A well designed Clearcut is visually acceptable, economic and ecologically appropriate.
- Involve the People who care.
- Partial cutting is very expensive.
- Use it only where critical.
- Integrate clearcutting into your partial cutting.



Virtual Decisions – About Real Environments: The Case for Multi-modal Information Support for Decision-makers

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Visual Resource Management in Forest Decision-Making

- Beyond the legal necessity to consider aesthetics as part of forest management, for many of us the visual landscape is the best indication we have of wise management or the existence of problems.
- The quality and contents of the visual landscape is a primary factor in making major personal decisions about siting homes, taking vacations. It is a major source of personal inspiration, restoration, stimulation.

The Influences of “Soft” Data in Decision-Making

- In many situations concern for the visual landscape, often coupled with related cultural and social issues, have been critical constraints on management.
- Even when not discounted or ignored, through lack of adequate communication, such information has not been accessible in technical planning processes.
- While we design planning systems assuming a rational, data-driven decision-maker ...

Revisiting the Benefits of “Traditional” VRM Methods, e.g. VMS

- Initial evaluation occurs in situ –immersed in a world of things, not images.
- Evaluation occurs in an integrated information environment.
- The evaluator (usually) understands the history and dynamics of the landscape.
- Over time the evaluator is engaged in manipulation of the landscape.

Criticisms of Past VRM Methods in the Planning Process

- Evaluations are made element by element rather than in an integrated context.
- VRM evaluations favor visual aesthetics over economic and ecological implications of change in the landscape, and vice versa.
- Decisions about future conditions are largely made as professional judgments relying on the planner’s ability to integrate visual evaluations with other quantitative and qualitative information.

Including Visual Quality Issues in Decision Making

- Until recently decisions were principally based on the written word, simple graphs and charts.

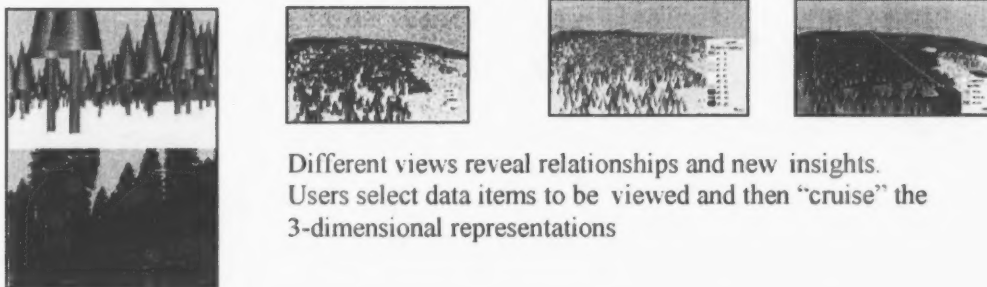
- Photographs tied to inventory data provide better explanations of the conditions found or expected in the environment.
- Computer tools enable the construction of complex three-dimensional immersive worlds that can readily pass for real world experience. (Leigh, Johnson, Brown, Sandin, DeFanti, 1999)

Attributes of Immersive Environments Match to VRM Strengths

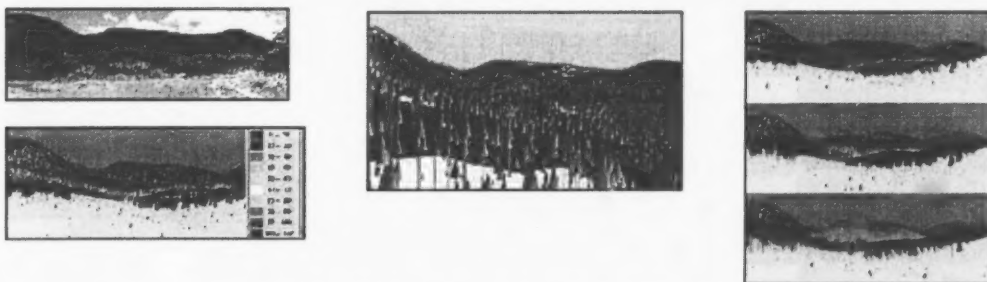
- Immersion – simulates direct experience
- Integrated – hyperlink access to multiple parallel data streams
- Dynamic – illustrates how system interacts
- Active – users feel as if directly experiencing the environment
- Initial evaluation occurs in situ – immersed in a world of things, not images
- Evaluation occurs in an integrated information environment
- Evaluator (usually) understands history and dynamics of landscape
- Over time evaluator is engaged in manipulation of the landscape

(Johnson, Moher, Leigh, Lin, 1999)

Integrated Visualization and Harvest Planning



Measuring Intention Against Outcome of Long-term Harvest Planning



Forest planning-US and Finland - SmartForest - <http://www.imlab.psu.edu/smartforest>

A More Comprehensive Visual Resource Management Environment

- The above elements suggest how advanced computer visualization environments might support VRM.

- The integration of quantitative and qualitative data, from archival and model sources, might provide a more comprehensive picture of the issues to be addressed in decision making –

And decisions would be made while “immersed” in a realistic environment.

Are We Talking About Decision Support Systems?

- Integrated software tools that query and manipulate disparate data sets through a graphical user interface to solve semi- or unstructured problems. DSSs integrate and disseminate data to provide better understanding of issues.
- Data may be accessed via hypertext, geographical information system (GIS), or dynamic models according to hierarchical, topical, spatial or temporal references. Data can be charts, text, audio, animations, etc..

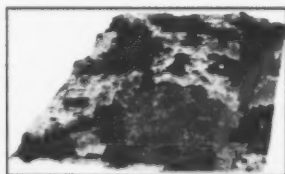
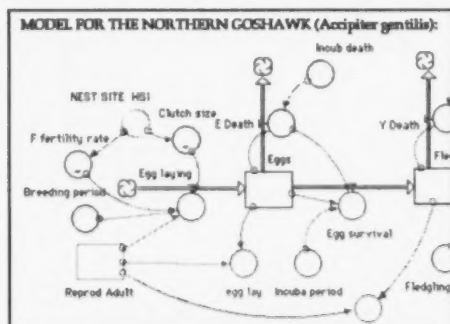
The Role of the Visual Display in Decision Support

- Dynamic visualizations seem to be beneficial for decision support.
- DSS users experience shorter times to find solutions to problems and have fewer errors.
- Visual presentation of information enables better integration of information from multiple sources.
- Visual information aids problem identification, finding solutions, and communicating results. (Denzer, 1993; Fedra, 1995; Crossland and Wynne, 1995)

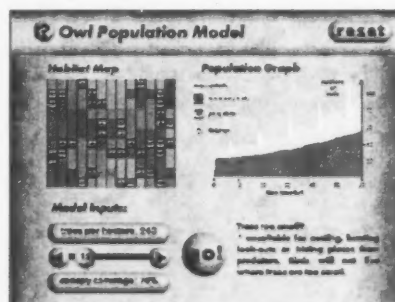
Data and Data Limitations

- All data present limitations
- Modeled numeric projections
 - may be scientifically defensible, but present much uncertainty or error.
- Archive data - numerical, historical, statistical.
 - may be accurate, but are set in wrong temporal context.
- Expert judgments of expected outcomes.
 - may be highly reflective of context, but include bias or prejudice.

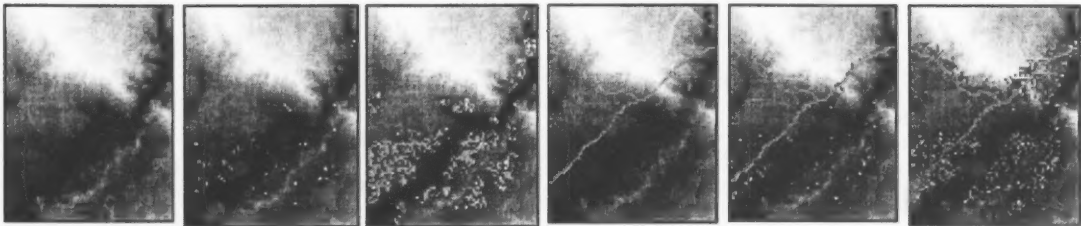
Visual Interface to Dynamic Models of Ecosystem Processes



Dynamic modeling applied to natural systems may be accessed through simplified interfaces for public use. (Stella and SME)



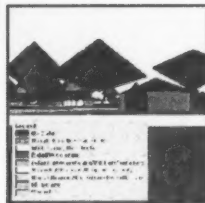
Visualization of Social Processes – Urban Sprawl Around Chicago



Dynamic modeling enables rapid experimentation with “what-if” scenarios. Here urban sprawl is affected by land value and relief, and by the location of new roads. (StarLogo)

Kane County (Chicago collar county) Urban Edge Expansion Model

Visualization of Previously Non-Visual Information

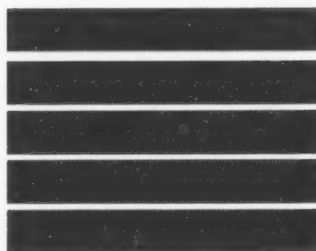


Arc-View 3-D and VRML interfaces enable data to be manipulated and read by non-expert users. Data-generated house icons show property use, condition, materials etc.



SmartCity Interactive Visualization – <http://www.imlab.psu.edu/smartcity>

Visual Interface to a Regional-Scale Economic Input-Output Model



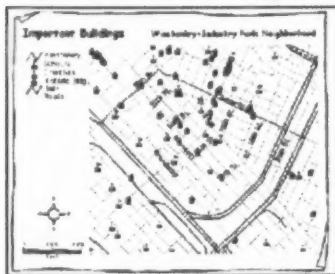
Urban Systems Models

Web-based model of economic activity enables citizens to identify the results of new investment:

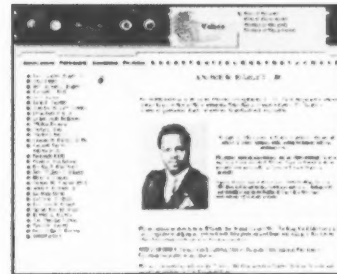
1. *Changes in employment levels and job types in the area*
2. *Pollution and other impacts*
3. *Changes in sales and income*
4. *Changes in fiscal expenditures*

East St. Louis Economic Impact Model - <http://www.eslarp.uiuc.edu/usm>

Visual Interface to Spatially Distributed Qualitative Data



Interface to web-based GIS for the East St. Louis area, includes historic archive and anecdotal data sources.

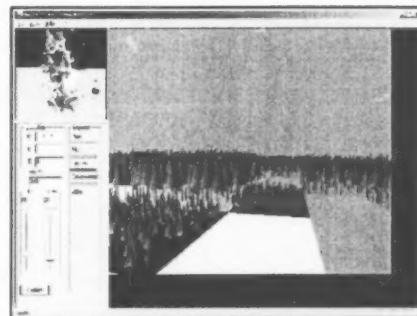
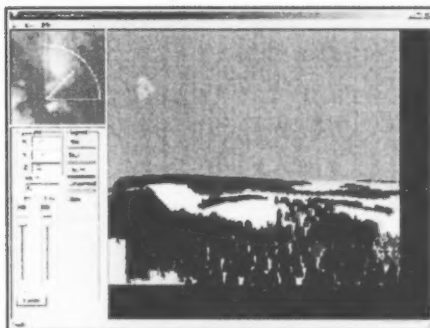
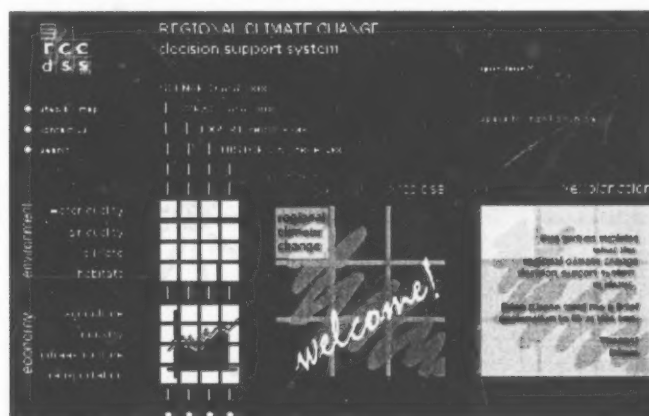


East St. Louis - EGRETS GIS Interface - <http://www.eslarp.uiuc.edu/egrets>

Integrating Disparate Data

- Integrating qualitative and quantitative information in a common spatial context allows citizens and agencies to consider future scenarios including biophysical, cultural-historical and "informal" knowledge.
- All data may play significant roles in decision-making processes if seen within the same framework as other data types.
- Making the DSS available via the web enables ready access and collaboration.

What Would This Decision Support System Look Like?



VRM, Immersive Visualization, and Decision Support Systems

- The goals of each of these tools is to engage people more closely in the examination and understanding of situations that face them in making planning decisions.
- A successful Decision Support System might integrate all of these techniques to immerse users in the planning situation -- with a set of tools that enable them to play out future scenarios and display the results to themselves and others in a variety of flexible and interactive formats.

Visual and Virtual Decision Support

- In 1971 Visual Resource Management was, conducted in a rich environment of quantitative and qualitative data, integrated through the mind of the evaluator, all the while immersed in the visual landscape.
- In 2001 we are able to immerse the user and have them suspend belief and behave as if they were in the actual environment.

We must push our new tools to promote more intimate transactions between information user and the widest possible range of information

Public Preferences of Forest Management Practices in Québec

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The Importance of the Landscape in Québec

- Individual and collective heritage to preserve
- Potential for the tourism industry
- Esthetic environment for recreational uses and touristic sites
- People's perception of the quality of the environment and of its management

Visual Impact of Forest Management Practices

- Why does the public generally have a negative perception of a harvested area but not of an agricultural landscape? Harvested areas are chaotic, which is a sign of degradation to the public
- People prefer the cleanliness and neatness of agricultural lands as opposed to logging debris and slash
 - people like to go in the wilderness, not in harvested areas
 - geometric cutblocks look artificial.

People's Concern About the Visual Quality of the Landscape

- Over the last decade, more people have voiced their concerns about the visual quality of the landscape
- In the southern part of Québec, in many cases it has resulted in the implementation of municipal regulations that often restrict private forest landowners in the way they can manage their forests. The regulation aims at minimizing or sometimes avoiding the visual impact forcing landowners to use practices that are not appropriated for the type of stand or that are sometimes more expensive for the owner
- On public land, concern has grown with increased access and use of the forest and by the expansion of harvested areas
- Certain regulations dealing with visual impact do exist in Québec, but they do not always result in socially acceptable landscape

The Economic Value of the Landscape

- The forest is linked to the economic development of:
 - wood product related industries
 - tourism and recreational related industries
- The landscape can be seen as one of the forest resource

The public perception study was conducted north of Québec city in the boreal forest. The proximity of Québec city results in an important recreational use of the area. Eleven different user groups (309 persons) participated in the study. We used slides to evaluate the landscape quality. In this particular study, clearcuts were located in the middle ground zone which we defined for our region to be between 500 m and 3 km. The landscape evaluated where common to the area and not outstanding in visual quality. Clearcuts occupied different percentage of the visible landscape. In the green-up study, the clearcut represented 50 % of the visible landscape and we had different regeneration height classes.

Visual Impact of Clearcutting - Single Patch Cutting

- Like many other public perception studies done in British Columbia and the United States, we found that acceptability decreases with an increase in the proportion of the visible landscape occupied by a clearcut
- Despite a generally unfavorable opinion of clearcuts, a certain level of landscape alteration was found acceptable
- Clearcut must be limited in term of the proportion of visible landscape it occupies
- 25% or less in plan view was found to be acceptable
- 40% or more in plan view was found to be unacceptable.

Visual Impact of Clearcutting - Dispersed Patch Cutting

- When a clearcut is dispersed into smaller blocks, it results in a better integration in the landscape
- But a large number of smaller units is less scenic (Palmer et al. (1994))
- Most subjects (62%) judged an average level of 50% removal by dispersed patch cutting in plan view to be acceptable. (This level of removal met the maximum modification objective defined by the BC Ministry of Forests (1991))

Note: As a result of patch cutting most stands are disrupted and the forest landscape appears broken up. The cut blocks in our study ranged in size from 10 - 50 ha and were compatible with the stand mosaic in the boreal balsam fir forest. The cut block size were acceptable in the middle ground view. In closer range, results may have been different.

Visual Impact of Clearcutting - Visually Effective Green-up

- An important factor to consider when determining if a landscape with existing visible alterations is ready for an other entry: the height of the regeneration affects the level of acceptability
- Cut areas with no visible regeneration rated the lowest in acceptability
- When the regeneration reached a height of 4.1 to 7 m, the landscape was judged acceptable
- In BC (1994) a study yielded similar results: stands under 4.0 m had less than 10% probability of meeting VEG; at 5.5 m it was 50% and at 7 m it was 90%

Public Perception of Clearcutting

- The study, along with an extended review of literature enabled us to draw guidelines to better integrate visual considerations into forest management practices
- However, the study was limited to the boreal forest, the middle ground views, on public lands.
- The many forest types, viewing distances and the large proportion of private lands in the southern part of Québec commanded other studies to define public preferences

Public Perception of Other Management Practices

- Other perception studies addressed subjects such as:
 - soil disturbance such as rutting, windrow, thinning, woody debris resulting from stand management (within stands or along roads or trails), buffer strips, landings, stacking, delimbing and bucking areas, partial cutting vs clearcutting
- Studies were conducted in close range or within stands
- Softwood stands
 - managed stands rated higher than unmanaged ones
 - important visual impact associated with woody debris but also important source of nutrient: tend it but don't remove it.

When the woody debris are excessive, it is not acceptable to viewers. When saying that the woody debris have to be tended it is not meant that it has to be taken away. The debris should be left in place, it is an important source of nutrient and it also represents a habitat for different species (fauna and flora). We found that by simply bringing the debris closer to the ground, its visual impact was acceptable.

- Hardwood stands
 - managed or unmanaged stands rated high
 - important visual impact associated with woody debris but again, important source of nutrient: tend it but don't remove it
- Some «irritants»: some solutions
 - woody debris along roads, rutting, windrows, release of young trees, landings, delimbing and bucking areas, road construction or maintenance, buffer strips, partial cutting vs clearcutting

Defining Public Preferences

- Those scientific studies have confirmed that forest management can have an impact on the visual quality of the landscape
- On the other hand, they have also demonstrated that, to some extent, a certain level of landscape alteration is acceptable

Defining Visually Sensitive Areas

- Based on the conventionnal USDA Forest Service approach
 - *The Visual Management System* (1974)
 - *Handbook for Scenery Management* (1995)
- We used Seen areas and distance zones to define Visually sensitive areas.
- All landscape do not have the same importance and our efforts should be oriented towards those more critical areas
- Recommendations for those areas aimed at better integrating aesthetics consideration with forestry practices, but would not exclude forestry practices from those zones

Recommendations for the Management of Visually Sensitive Areas in Québec

Foreground Zones

- Clearcuts should be of smaller scale (size, length, extend)
- When possible, use alternative harvesting methods
- Concerns requiring special attention:
 - amount of woody debris
 - windrows location
 - soil disturbance such as rutting
 - landings, delimbing and bucking areas
- Use buffer strips

Middle and Background Zones

- Clearcut opening size should not dominate the landscape:
- Less then 15% altered in plan view will result in minor visual impact
- Between 15 and 40% altered landscape quality will be diminished but will still be acceptable to most viewers. Acceptability improves if people are informed
- Over 40% altered visual impact unacceptable to all
- Use of natural forms to better integrate the cutblock in the landscape
- Allow for fast visually effective green-up
- Distribute cutblocks over time and space (cumulative effect)
- Pay special attention to alterations along skylines and ridges

Conclusion

- Forestry's aesthetic policy should be socially acceptable, ecologically appropriate, easily comprehended, and economically feasible
- As Hull and others (2000), recomend, we are trying to put foward an aesthetic that:
 - is consistent with the science of forestry
 - take advantage of the visibility and communicative power of forested landscape to help create an ecological literate public aware of forest stewardship goals;
 - is socially acceptable and does not ignore current public standards of taste ».

References

- B.C. Ministry of Forests. 1991. Forest landscape management. Ministry of Forests, B.C. Forest Service. Victoria. Resource management.
- B.C. Ministry of Forests. 1994. A first look at visually effective green-up in British Columbia. A public perception study. Ministry of Forests, Recreation branch. Tech. Rep. 1994: 1. 56 p.
- Hull, R.B., D.P. Robertson, G.J. Buhyoff and A. Kendra. 2000. What are we hiding behind the visual buffer strip ? Forest aesthetics reconsidered. *J. For.* July 2000.
- Palmer, J.F., S. Shannon, M.A. Harrilchak, P.H. Gobster and T. Kokx. 1994. Long term visual effects of alternative clearcutting intensities and patterns. *In Proc. Of the 1993 Northeastern recreation researches symp.* USDA For. Serv. Gen. Tech. Rep. NE.
- Pâquet, J. and L. Bélanger, 1997. Public acceptability thresholds of clearcutting to maintain visual quality of boreal balsam fir landscapes. *For Sci* 43(1): 46-55.
- USDA Forest Service. 1974. National forest landscape management. Vol. 2. Chap. 5. Timber. USDA For. Serv. Agric. Handb. No 462. 39 p.
- USDA Forest Service. 1995. Landscape aesthetics. A handbook for scenery management. USDA For. Serv. Agric. Handb. No 701.

Visual Resource Management in British Columbia: Past, Present and Future

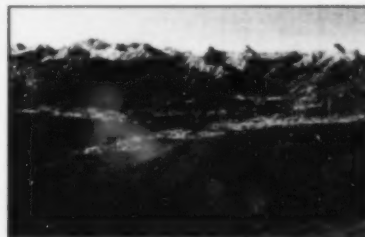
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Thank you for the invitation to speak to you this morning. It's a great pleasure to be here.

I have worked as a professional forester for the better part of a quarter century, both in the private sector and in the Forest Service. In that time, I have seen a great many changes in the way that we manage the forests in this province. One of the significant changes I have observed is the increasing trend towards managing our forest landscapes for aesthetic or social purposes.

During the 1970s, we worked hard to improve the environmental and biological aspects of forest management through using improved planning, protecting wildlife habitat, re-establishing non-productive forestland, and reducing site disturbance.

During this time, the population of the province grew in size and the population's ability to debate resource issues grew in sophistication. People now earn better wages than before, have more leisure time, and have higher levels of education than ever before. Given this development, more people are spending more time in our forests and on our highways. Civil societies have become increasingly more concerned with the condition of the environment. They are not only sensitive to what our forest practices mean from a biological conservation view point, but are also concerned with *how they look*, and what this means from a socio-economic standpoint with respect to non-consumptive opportunities and users of forests.



There is a strong public sentiment that has roughly and consistently said: if our forests look good, then the chances are that they are being managed well. I know from the work done here in British Columbia that people on the whole prefer unaltered landscapes over altered ones. As a friend of mine who is the master of mixed metaphors often says, this conclusion ain't "rocket surgery." Research has also proven beyond a doubt that as the size of cutblocks increases in perspective view, there is a corresponding increase in public dislike—more "brain science" at work!

Because visual resource management is tied strongly to public perceptions of good and bad, every forest management decision, even routine ones, must be approached with a sensible degree

of caution. In my experience, when managing public forests, be aware that perceptions are as influential as science. Recognize always that at the end of the day, in a public forest, the public will prevail. Ask Micarel Dombek.

Let me share with you a recent personal experience with visuals and perceptions of the public. One of my principal duties is to set the rate of harvest or annual allowable cuts (AAC) for all supply areas in the province. In October 2000, I released an AAC determination for the North Coast timber supply area.

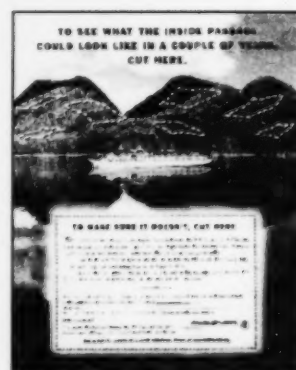
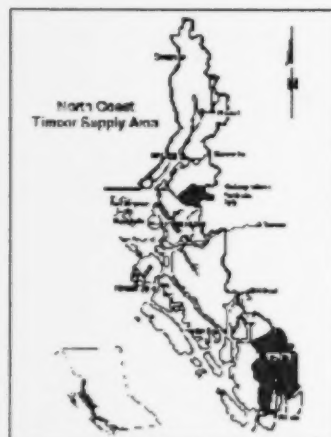
In formulating that decision, I recognised early on that visual resources were a very important consideration along the Inside Passage portion of this TSA, as it is the primary cruise ship passage to Alaska. In fact, prior to my AAC determination, the District Manager had declared the area as a "scenic area" under the Forest Practices Code. Consequently, in the AAC decision, I incorporated the fact that visuals would have to be managed more conservatively in this part of the TSA than elsewhere. The new AAC did not preclude harvesting in most of the area; it simply meant that harvesting would move at a slower pace, be more discrete, and allow scenic integrity to prevail on this landscape.

The David Suzuki Foundation took out a full page ad in the *Vancouver Sun* suggesting that the entire Inside Passage would be clearcut to what you, the experts, would call a maximum modification visual quality level—that is, without regard to the scenic integrity of the area. The newly formed Wilderness Tourism Association wrote the Premier, expressing concern that I was instructing companies with cutting rights along the Inside Passage to commence logging as soon as possible.

You wouldn't believe the furore that followed.

The reality was and still is that I simply incorporated current management assumptions in my determination. Those were that the Inside Passage was to be managed for a mixture of Partial Retention and Retention Visual Quality Objectives. A level of management that, on the whole, most stakeholders found acceptable. In a Partial Retention VQO, forestry activities may be visible, but must remain subordinate on the landscape and, as you know, in the case of a Retention VQO, activities are not to be visually evident.

Given that this area contributes to the timber supply of the TSA I noted in my decision that approximately 57,000 cubic metres of timber per year, or roughly six to eight cutblocks a year, would have to be harvested from the visually sensitive portions of the Inside Passage in this area. The area in question is about 18,000 hectares (or, for my U.S. friends who say, "what the heck is a "hectare"?), 40,000 acres in size.



I also noted that licensees had not been operating in this area, so suggested that if the Inside Passage contributed to the timber supply, then some of the harvest must come from this area. In other words, I was protecting against overcutting on the remaining part of the TSA. Nevertheless, the decision still met with strong public opposition.

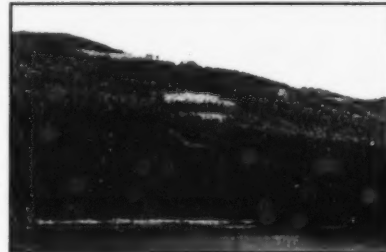


Don't misunderstand why I have raised this example. It's not self justification, but rather I want to point out regardless of who did what to who, and who said what to who, this experience shows the passion and vigour that comes to the debate about how to responsibly allocate and use public forests. The fact that I strongly disagree with how my decision was characterized is irrelevant when considered in this context.

Given this lead in, I am here today to talk to you about visual resources, the theme of this conference. So here's what I want to cover:

- I will review the past to show where we have come from.
- I will look at the present, what we are doing and why.
- I'll examine some of the issues we face; and
- I'll look to the future to outline where we are going with Visual Resource Management in this province.

By the end, you should have a good idea of the issues and circumstances surrounding Visual Resource Management in this province and some of the solutions to managing sensitive landscapes. I also add: if you don't accept the concept of sensitive landscapes, you might be in the wrong room. The seminar on bringing the buffalo back is next door.



So, to start I would like to ask the question, Why do we manage visual resources in British Columbia? The answers to this question are many and varied.

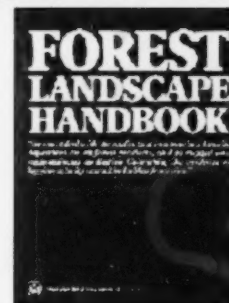
- Part of the public prefers unaltered landscapes.
- Scenic viewing is one of the top recreation activities in our forests.
- Our Forest Practices Code states that the sustainable use of the forest includes conserving scenic values.
- Natural and well-managed landscapes provide the primary attraction for part of our tourism industry.
- Visual Resource Management (VRM) provides the public with more confidence that the landscapes are being managed in an environmentally acceptable manner.
- High Level Plans contain commitments regarding visual resources. These are Cabinet level, approved land management directions, intended to reflect the will of the public.

The Past (Visual Resource Management Milestones)

British Columbia hired its first Landscape Manager, Pem Van Heek in 1979. Many of you will have met Pem. He served much like an ambassador, introducing the notion of VRM and encouraging industry and Forest Service practitioners to manage differently on visually sensitive landscapes. I personally recall numerous encounters with Pem in the late 1970s and early '80s as he challenged my understanding of my obligations as a forester and tried to hammer new concepts and ideas into my THICK SKULL. You got through in the end PEM, even if I was a slow learner!



Pem was instrumental at getting the *Forest Landscape Handbook* published in 1981. This set out some basic design principles, explored the whole idea of visual landscape management and introduced the forest landscape management (FLM) system. This handbook and the associated policy released in 1982 were milestones that set out for the first time that one of the goals of forest management in the province was to minimize adverse visual impacts from forest harvesting on certain parts of our landscape. I emphasize ... *on certain parts of our landscape*.



During the early to mid-80s, the Forest Service concentrated its efforts on carrying out visual landscape inventories to identify those areas in the province that are visually sensitive. As of 1996, 12.9 million hectares (30 million acres) of sensitive area had been inventoried. These inventories identified those areas of the province that warrant attention to visual values during planning processes.

By the late 80s Visual Quality Objectives (VQOs) were the cornerstone of the Visual Resource Management program and became the means by which the Forest Service identifies the level of alteration that would be acceptable on a viewscape. In the early 1990s the Visual Resource Management system and Visual Quality Objectives became one of the first non-timber resources to be incorporated into Timber Supply modelling and analysis used to support decisions on how much harvesting could or should be undertaken in a given area.

In 1995, the ever-popular Forest Practices Code was introduced in BC. The FPC Act and associated regulations compelled and enabled visual resource management, along with a host of other improvements in forest management.

Also in anticipation of the code, the Visual Landscape Design Training Manual was prepared and related training is still ongoing to this day. Training is but one of the many obligations arising from operating in an environment of continuous improvement and change.

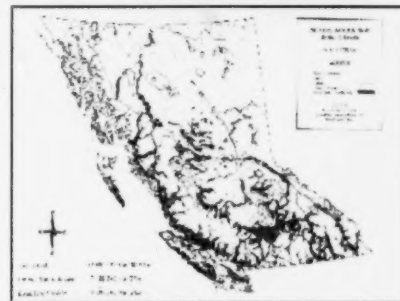
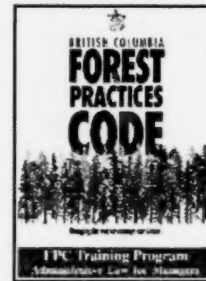


TABLE 1
Relationship of Landscape Sensitivity and Visual Quality Objectives

LANDSCAPE SENSITIVITY	Visual Quality Objectives (VQO) and Associated Management Actions			
	RETENTION	PARTIAL RETENTION	MODIFICATION	REMOVAL
HIGH	Active management to retain visual quality	Active management to retain visual quality	Active management to retain visual quality	Active management to retain visual quality
MEDIUM	Active management to retain visual quality	Active management to retain visual quality	Active management to retain visual quality	Active management to retain visual quality
LOW	Active management to retain visual quality	Active management to retain visual quality	Active management to retain visual quality	Active management to retain visual quality

Current Management (Today)

As of this date we have 22 years of VRM history behind us. The VRM system in BC has evolved to address our particular needs and circumstances. In BC we are extremely economically reliant on our lumber and pulp and paper products industry. But we but also have a growing, vibrant tourism industry. Consequently, one of our many challenges is to meet the ever-present demand for fibre while maintaining visual quality and meeting the needs of the growing recreation and tourism sectors.



It is imperative that we honour commitments made to the tourism sector and others through various accords, memoranda and our many planning processes regarding visual quality. If we don't, public distrust and lack of confidence will dog us at every step along the way. We have developed a robust but flexible VRM system that can be understood and implemented by technicians and foresters throughout the province.

So, how do we do this? Where do we start? Visual Landscape Inventories are the first step in our Visual Resource Management process. They are used to delineate, classify, and record areas in the province that are considered to be visually sensitive. We have developed an entire procedures and standards manual to address this topic. Number one rule – inventory, inventory, inventory ... get your info base right ... first.

Completed Visual Landscape Inventories are fed into provincial planning processes at both the strategic and local level. At the strategic level the inventory is primarily used to identify the location of sensitive landscapes. At the local level, inventory information assists land-use planners and resource managers in deciding appropriate land uses, resource development objectives, and management prescriptions.

It should be understood that the completion of a Visual Landscape Inventory does not ensure the appropriate management of any given area. It is information for consideration in resource management decisions.

Specific steps must be taken under the Forest Practices Code to ensure that the inventory is used and applied to ensure that scenic integrity of specific areas is maintained.

To better define the level of management on a sensitive landscape, Visual Quality Objectives or VQOs need to be established.

VQOs serve to do a number of things:

- They provide the public with more confidence that visual resources are defined, understood and are being well managed.
- They provide a measurable and auditable target, operationally.
- They provide measurable criteria for estimating timber availability and rate of harvest in timber supply analyses
- They are binding once established and included in an operational plan.
- They require that a Visual Impact Assessment be completed to ensure VQO is achieved.

Once visual quality objectives (VQOs) have been established, Licensees must identify and describe, in their forest development plans, the location of scenic areas. Next they must specify what measures will be taken to manage and conserve the visual resource. Finally they must demonstrate through a visual impact assessment whether or not the Visual Quality Objective will be achieved.

Visual impact assessments simulate, in perspective view, the visual effects that proposed timber harvesting or road construction operations will have on the scenic landscape. You've seen the incredibly sophisticated tools we now have at our disposal in the poster session.

One of the key tools we employ to achieve VQOs are visual landscape design techniques. My staff describe visual design as a creative process that involves working with the visual patterns and forces of nature to guide changes to the resource in ways that meet the needs of society, ... aesthetically, biologically and economically. Hmmm...repeat, it's a creative process.

It's never simple, but the goals are laudable and must always be planned in concert with the other factors governing resource management. Non-practitioners and sceptics call this the voodoo phase or the wave the magic wand phase. I like to think of it as the right side of my brain at work...although the left side of my brain always disagrees with that observation.

Integrated visual design is used to design balanced plans that work at the landscape level, and which strive to achieve an acceptable visual solution for managing the area.

Visual resource design solutions developed at the landscape-level are subsequently refined at the stand-level where specific forest practices may be chosen or modified to further reduce visual impacts (e.g., block orientation, screening adjustments, skid trail and landing locations, etc.).

So, How Do They Like Us So Far?

Well, we are government so you figure it out!

Like many disciplines VRM has its supporters and critics.

To some forest managers, VRM represents an increased cost of doing business with limited benefit.

To others it is simply window dressing, supported by perception studies and research initiatives that are considered a form of voodoo science.

The environmental community sometimes points out that the restrictive nature of VRM doesn't allow forest management to mimic natural disturbance processes, like fire.

The tourism sector on the other hand sees VRM as an extremely important management concept which is vital to their future.

The travelling, recreating public tells us, time and time again, to respect the scenic integrity of important view-sheds.

Obviously, it's a balancing act, and I would like to take a few minutes to address some of these issues.

It is fact that more restrictive VQOs can result in a decreased wood supply and higher harvesting costs where traditional clear cutting is utilised. However by utilising partial cutting systems it is possible to remove significantly more volume from an area with little or no visual impact.

The cost of partial cutting in many areas of the interior of the province is only slightly more than clearcutting and is today an accepted way of doing business to meet multiple use objectives including social objectives.

On the Coast partial cutting is by all accounts more expensive and will require higher value timber to make it economical. This being said International Forest Products has experimented with partial cutting at Chamis Bay in Kyuquout Sound and Timfor Contracting has practised strip cutting in Knight inlet.

I'm not naïve but it is my hope that as more licensees do this, we will continue to improve our ability to undertake this work in an increasingly cost effective and efficient manner. But I accept, it doesn't come for free ... someone has to bear the cost ... may capture less rent therefore lower stumpage ... but that's another story for another day.

Let me offer some views on the "pseudo science arguments!" Public perception research is like any other forest research. It is heavily reliant on statistics and regimented sampling procedures. The reality is public perception surveys are very accurate. Polling companies routinely and accurately predict elections using this methodology. In the recent US election they said it was too close to call, and they were bang on the money. Public perception surveys use the same methodology.

To those who feel VRM is subjective and simply window dressing I ask the question why don't we log the North Shore Mountains behind Vancouver? Those forests are mature, readily available and close to the log market.

Our research suggests that given the numbers of people in Vancouver and their concern for the landscape, logging the North Shore Mountains would be a non-starter. Perhaps social science is keeping us out of more trouble than we're prepared to admit.

There is also a counter argument to the assertion that VQOs will not allow activities that mimic natural disturbance processes to occur.

A visually sensitive landscape managed across a combination of VQO zones does provide for a balance of cut and leave area that, if combined with creative stand management techniques, can readily approximate landscape level disturbances.

However, these benefits are not easily attained. It takes a lot of work to get this balance right. This could be designed spatially so as to look like a burned landscape and maintain the scenic quality of the landscape.

Partial Retention objectives result in smaller openings, but could see 75% of the unit altered on an 80-year rotation using conventional clearcutting. I see flexibility in what can be done, as long as we are prepared to take care in the analysis, planning and design phase.

On the other hand, a Retention VQO is intended to retain the majority of forest on the landscape for a long period of time. These areas could make good candidates for old-growth reserves and often provide the multiple benefit of meeting forest cover and habitat objectives for wildlife.

Upon reflection it would seem that there is a reasonable level of flexibility to manage for biodiversity and visual objectives on the same areas.

Let Us Look To Our Supporters.

The tourism sector sees scenic landscapes as being critical to their business. The wilderness tourism industry is not encouraging tourists from the US, Europe and Japan to come and look at highly modified landscapes in all areas of the province.

Their marketing is geared to actively promote the Super Natural qualities of BC. Natural, and/or, well-managed landscapes can both fit that bill. My point here is that the forest sector and the wilderness tourism sectors are neither mutually exclusive industries. They should not be viewed as, either/or, propositions. There ought to be room for both on a well planned, carefully allocated and managed land base.

Again, it takes care, respect and hard work to go this route.

Now that I have talked a little about the past, explained how we are doing business and identified some of our issues, I would like to look to the future and tell you how we hope to deal with the challenges.

What Does The Future Hold?

I am confident in saying that Visual Resources will continue to be a value that will continue to be addressed in our forest planning and operational implementation.

We must ensure that our spectacularly beautiful province remains beautiful. And not just for the hundreds of thousands of visitors that come here each year, but for ourselves, and our children and their children.

To ensure this happens I see the need for:

- a better understanding of all forest user needs and expectations
- the application of more integrated visual design techniques to resolve social, biological and economic concerns.
- better tools to simulate and test various design options to resolve landscape character issues over the short and long term.
- improved timber supply modelling capability to determine the effects of our decisions.
- more training, to better equip Forest Service and industry staff to use the latest technology and innovation for the job at hand.
- And one I add -- due and full recognition of the social and economic costs associated with meeting these obligations.

There are a number of exciting and innovative visual projects currently underway that will provide an invaluable knowledge base as we move forward into the new millennium. You will hear of many of these over the few days.

This conference is just one of several exciting initiatives that will assist us to better understand the dynamics of managing visual resources. I'm looking forward to hearing the other speakers. We will hear from leading edge researchers and practitioners about exciting and innovative solutions to today's visual resource management challenges.

Let me give you another example of an interesting project which is underway -- Nimmo Bay Lodge. Value of a View Project.

Located on BC's mainland coast, off the northern end of Vancouver Island, Nimmo Bay Resort is reached by helicopter or float plane from Port Hardy. It is a high end, Adventure Tourism Lodge known, internationally for its heli-fishing and heli-touring adventures.

A study is underway to determine potential crown revenues derived from the lodge viewscape through timber harvesting activities and alternately through non-consumptive tourism use.

The lodge viewscape has been defined using a computer mapping program and field checked.

The timber volume within this area and its net worth in stumpage has been calculated using Forest Inventory data and current stumpage rates for the area.

The tourism revenue in the form of direct PST and GST has been collected from the lodge.

These rudimentary measurements provide a glimpse of what a greater analysis will reveal. A more in-depth economic analysis is currently being conducted by the Ministry's Economic and Trade Branch.

A public perception study has also been conducted as part of this study to determine how lodge patrons respond to photographs of various levels of visible landscape alterations and the use of different silvicultural systems.



It is postulated that we may be able to determine the level of forestry activity lodge patrons will accept while still continuing to frequent the facility.

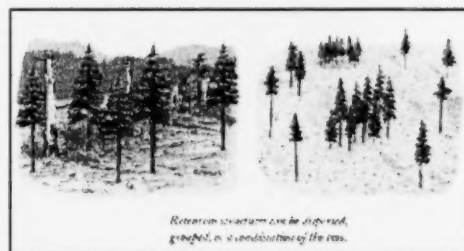
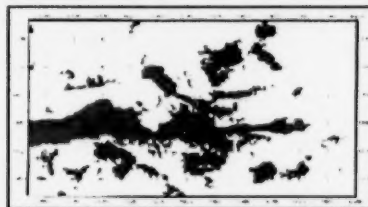
Finding this threshold is an exciting prospect, as it would represent a win/win situation in terms of using good information and hard work to find that elusive balance. Government could well reap some tourism benefit and some forestry revenue vs an either/or situation.

I want to also talk about a new concept known as variable retention silviculture. The Forest Service has in the past carried out research to correlate site and stand variables to visual quality. As a result we have developed the percent alteration table for clear cutting and volume or stems removed table, for partial cutting, which many of you will be familiar with.

With various companies' announcements that they intend to move more to retention silviculture systems, we have begun sampling mid slope retention system blocks across the province.

We have taken photographs and collected site and stand data on 36 sites to date and hope to sample an additional 15 to 20 sites this year. We will then carry out a variety of statistical analysis routines to determine if there are any post harvesting site and stand variables that predict the visual result.

We hope this work will lead to the development of another tool that could be used by the practitioner in the field to predict a visual outcome.



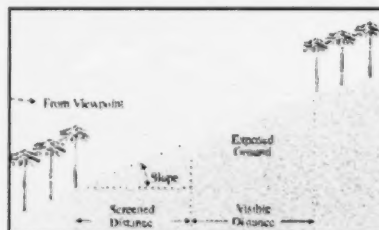
Timber Supply Modelling (Plan to Perspective Research)

Knowing what we are talking about is always half the battle. It is often alleged that the timber supply impacts of managing for visuals is either poorly understood, or not properly considered or balanced.

In 1996, we looked in at this issue closely and used our findings to further guide our actions. Modelling these complex and dynamic interactions across time and space is not a simple matter and we continue to explore better ways of doing things.

Our most recent thinking to more accurately model the timber supply impacts of our visual management regime, is to first identify what we are doing in perspective view (i.e. determine percent alteration in perspective view) and then translate this to plan view for modelling purposes. To do this requires that we better understand the perspective to plan relationship -- aka P2P.

P2P is the relationship of visible disturbance in perspective view relative to actual area removed in plan view. Every piece of ground has its own unique P2P ratio, which is dependent on four factors: viewing distance, angle of view, slope of the land and stand height.



To date, they have sampled 168 VIAs. The assembled data was inspected to determine if there is a correspondence between the alterations measured in plan or map view and the same alteration measured in perspective or photo view. This study found that on average 1.6 times as much is harvested in plan view as is apparent in perspective view. So what you say? Well, it means more timber supply is available while still meeting our visual objectives... or in some cases... vice versa!

We have undertaken two different studies to address this issue. First we took a real life landscape and designed 6 harvesting passes for it.

Each pass could not exceed a Partial Retention VQO (7 percent alteration) in perspective view. When the 7 percent alteration limit was reached for each pass we then analysed what we had achieved in plan view.

This study concluded that for every percent altered in perspective, we had removed significantly more in plan view.

For all blocks and all viewpoints it was concluded that the area weighted P2P was 1: 2.75. In other words for every percent in perspective you see you could remove 2.75 of the area.

To ground truth the results of the model our experts have spent time sampling the results of Visual Impact Assessments conducted in the field.

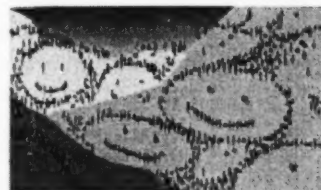
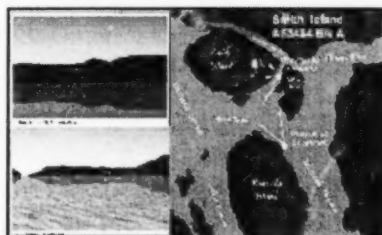
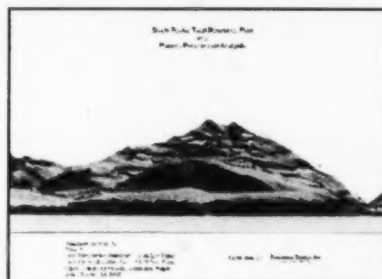
Our vision is to determine the level of harvesting approved and achievable in perspective view. This number would then be multiplied by the P2P ratio to derive a plan view number for timber supply modelling purposes.

It is important to understand the implications of the P2P relationship. When this ratio drops timber supply is being constrained. If we can increase this ratio through better design there will be less constraint on timber supply.

Conclusion

I hope I have made it clear that the Forest Service is committed to expanding its knowledge and understanding of Visual Resource Management.

This is a complex subject area, which is often poorly understood by foresters, managers, and many other people directly and indirectly involved with forestry. It involves us understanding what people think and feel about certain of our forestry practices in specific areas, and then, based on what they see, responding to this need.



Foresters solve the 'unsightly clearcut' problem

In the past few years several coastal companies have announced policies that will move them away from clearcutting and towards alternate systems. This was a corporate decision made in direct response to changes in public values and perceptions as well as new and emerging trends in information about forest ecology.

A public relations battle did not turn the tide. Ultimately, a change of practice to something that the public sees as more acceptable, became the goal. However, even this level of change will not satisfy everyone.

We have come a long way and we likely have a long way to go, but our direction is clear.

We are working to develop the tools, knowledge and data to help put VRM into play, and make it a key tool in our toolbox.

Lets move ahead and practice VRM more aggressively where it is important to help us attain the complex multiple objectives that must be met in a public forest.

Conferences like this one will help those working in our forests to become familiar with new research, practices and approaches.

So in summary... in accordance with the FPC and under our VRM process, our SDM's must exercise their SD to declare an SA based on the VLI conducted in accordance with the VRM-P2P, QA framework and then move through the phase of RVQC's to the declaration of VQO's so that the preparer of a plan can do some 3D or P2P analysis to set his harvest plan on the basis of a VIA which is fully informed by good VLD analysis using GIS and GPS -- OK?

At least that's the way it's supposed to work. Test to follow...



Using Integrated Visual Design to Resolve Resource Management Conflicts

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Presentation Outline

- Background: challenge of integrating forest values at an operational scale
- IVD Process: creating a design that "fits" the landscape
- Bear Lake Case Study: applying the process
- Concluding Thoughts: benefits, costs and challenges

Background

Historical Approaches to Forest Management:

- Primary objectives: timber production and forest protection
- Key considerations: efficiency and utility, but not aesthetics
- Planning process: engineering and science-based, with limited direct public input
- Forest users: fewer in number and more dispersed

Current Approaches to Forest Management:

- Objectives/strategies: more ecosystem-based (balance with extractive objectives)
- Key considerations: include broader social values such as aesthetics, conservation...
- Planning process: greater and more direct public participation
- Forest users: greater numbers; more diverse

Balancing Values at an Operational Level:

- Economics: timber harvesting - location, design and scheduling
- Environment: ecosystem structure and pattern; soil and water protection, specific habitat requirements
- Social: aesthetics; conservation, recreation, cultural and heritage values
- Other forest uses: FN, botanical, public / commercial recreation, water, trapping...

We must look beyond the influence of the cutblock and cutting permit, to ensure that all values are integrated across the landscape and through time.

Filling the Planning Gap:

- Higher Level Plans: broad objectives, strategies, zones
- Landscape Unit Plans: more detailed zoning, resource guidelines, habitat modelling
- Forest Development Plans: five year harvest plan (what about the next 95 years??)



- Integrated Visual Designs / Total Resource Plans: can fill the gap between broad, strategic direction and short term operational plans

IVD Process

- Similar to Total Resource Planning process.
- Operational Scale: about 500 to 5,000 ha
- Visual design is considered during each step, not near the end of the process.
- Simulation tools are used to view the design in 3 and 4 dimensions.
- Can be applied anywhere, but particularly in visually sensitive areas.

1. Objectives
2. Inventory
3. Analysis
4. Design Concept
5. Final Design
6. Documentation and Approval
7. Implementation
8. Monitoring and Revision

Step 1: Define Objectives:

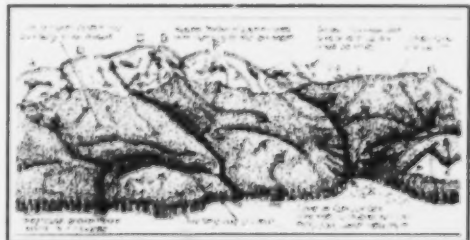
- Objectives provide targets for the outcome of the design.
- Objectives may come from:
 - legislation
 - higher level plans
 - site inventory and assessment
 - Need measurable criteria: whether quantitative (timber, range...) or qualitative (visual, water quality...)

Step 2: Gather Resource Information:

- Site Factors: soils, water, forest types, slope stability, archaeology...
- Ecological Factors: wildlife habitat/use, rare/endangered species, natural disturbance history...
- Visual Landscape Factors: visual sensitivity, key viewpoints, key features...
- Management Factors: insects and disease, silvicultural systems, recreation opportunities, access, previous harvesting...

Step 3: Resource Analysis:

- Opportunities and constraints to development
- May include operability, site productivity, FENs, slope stability, riparian, habitat...
- Visual analysis: provides a natural framework for the design
- Landform analysis (visual force lines)
- Land feature analysis (surface patterns)



Step 4: Design Concept:

- Location, shape and scale of units is guided by visual analysis and opportunities/constraints.



Step 5: Final Design:

- Design of units is refined based on 2D and 3D views.
- Silvicultural systems are assigned.
- Scheduling of activities is worked out.
- Show/describe design as it evolves over time.



Pass 1



Pass 2



Pass 3



Pass 4

Step 6: Documentation and Approval:

- Document all steps in the design process.
- Show the analysis and design in 2D (map), 3D (perspective) and 4D (passes over time).
- Approval may involve public groups as well as MOF and other agencies - clear visual presentation is critical to understanding.
- Photographs and simulations provide benchmarks for monitoring.

Step 7: Implementation:

- IVD becomes operational extension of any HLPs.
- First phase of IVD is incorporated into FDP.
- Silviculture Prescriptions will refine stand-level objectives and strategies.

Step 8: Monitoring:

- Framework of the design is robust, but flexible.
- Natural disturbances, new information, etc. may result in fine-tuning over time.
- Results compared to objectives - feedback loop.

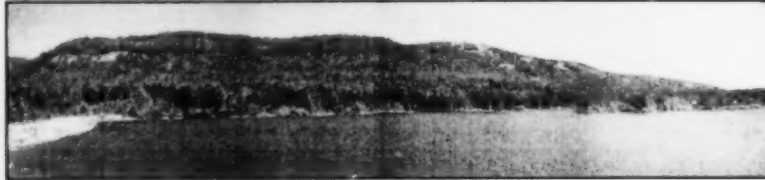
Bear Lake Integrated Visual Design

Bear Lake:

- Located west of Kelowna at 3,800 m.
- Plan area is a 1,600 ha viewshed around lake.
- B class lake within 2 community watersheds.
- Retention VQO, rec site and fishing camp.
- Small Business area - need to define a viable first pass and sustain harvesting over time.

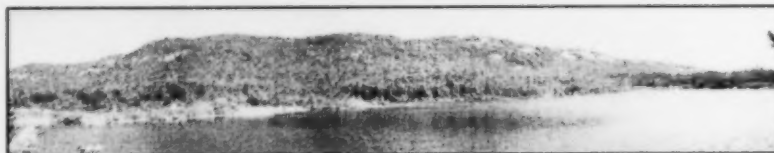
Key Viewpoint A:

- View southeast to study area from dam site at north end.
- This large open area receives heavy day use.



Key Viewpoint B:

- View east to study area from recreation site.
- Receives heavy use during summer months.



Note steep rocky areas and natural openings (good visual absorption).

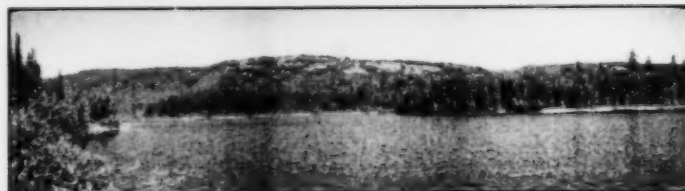
Key Viewpoint C:

- View east to study area from UREP.
- Seldom-used area at present.
- Good viewpoint for designing.



Key Viewpoint D:

- View northeast to study area from south end.
- This viewpoint used to launch cartoppers.
- North end of lake and low areas are screened.



Resource Objectives:

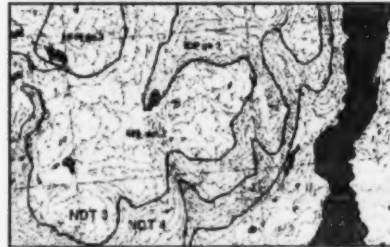
- Sources: from LRMP, FPC, district consultation.
- Timber: optimize harvest opportunities.

- Visual: Retention VQO in visual areas; Modification in non-visual areas.
- Fish/Wildlife: protect stream and lakeshore habitat; maintain moose winter range habitat.
- Water: maintain water quality and storage capability for downstream users.
- Recreation/Tourism: maintain a natural-road environment for fishing/camping.

Inventory:

Natural Disturbance Types

- NDT 3: stand-initiating fires; even-aged stands; aggregated units w. patch retention
- NDT 4: stand-maintaining fires; old mixed stands; partial cutting and smaller dispersed units.



Visuals.

- Viewshed from viewpoint B (recreation site)

Visual Quality Objective (VQO) of Retention



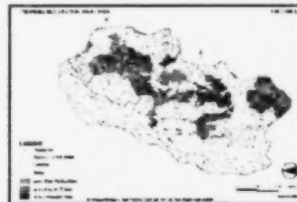
Terrain.

- Terrain Hazard (class 4 and 5)
- Steep slopes generally over 60%

Terrain ↑
Site Productivity ↓

Site Productivity.

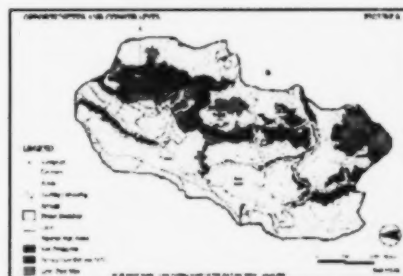
- Non-productive sites
- Low and poor sites



Riparian.

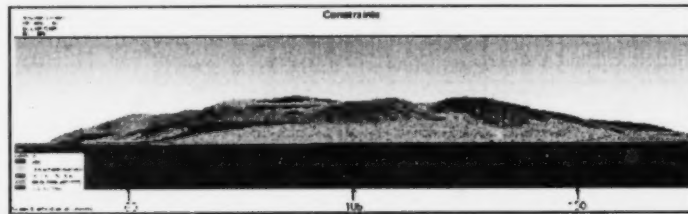
- Riparian and lakeshore management zones (Class B)
- Community watershed boundaries

Analysis: Opportunities and Constraints.



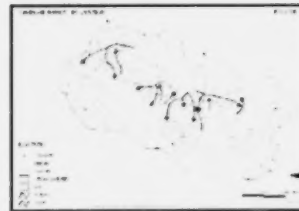
Analysis: Opportunities and Constraints.

- View as seen from rec site
- Terrain hazard class 4 and 5
- NP, low and poor sites
- Riparian management areas



Visual Analysis:

- Landform Analysis (visual force lines)
 - Defines 3D form of the landscape
- Arrows follow ridges and draws



Visual Analysis:

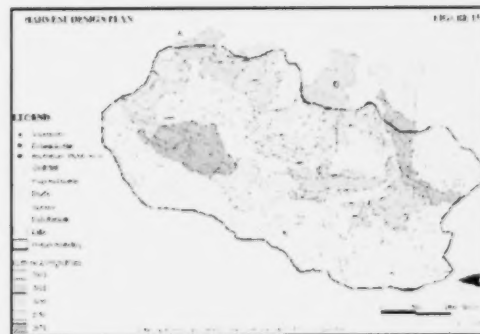
- Land Feature Analysis (surface characteristics)
- Visual patterns express underlying processes (soils, drainage, climate, natural disturbances, edges...)

Harvest Design:

- Units arranged in 5 pass system
- Variety of unit shapes and sizes
- Variety of silvicultural systems used

First Pass:

- Yellow blocks
- Mixed stands of Fd and Pl modelled as Selection - will actually be Sel, Patch, and CC with reserves



Second Pass:

- Olive green blocks
- Primarily Pl (Fd)
- Modelled as selection - will be Patch and CC with reserves

Fifth Pass:

- Remaining 3 passes shown
- Not as visible as passes 1 & 2
- Located on plateau and low areas

First Pass Summary:

- Area: 122 ha
- Volume: 24,416 m³

Cutblock	Species (%)	Area (ha)	Volume (m ³)	Silvicultural System	Harvest System
1A	Pl-90/Fd-10	39	9,485	CC-res (10% Fd)	GB
1B	Pl-100	19	4,620	Patch (leave any Fd)	GB
1C	Fd-100	5	798	Sel (45% removal)	Aerial
2	Pl-75/Fd-25	59	9,513	CC-res (10% Fd)	GB w. Cable
Total		122	24,416		

Benefits of Integrated Visual Design:

- Integration: is able to accommodate a wide range of resource values (not just visual).
- Structured Process: analyzes the landscape and uses this as a framework for design.
- Visual Component: present throughout the process.
- Permanence: final design is based on long term and permanent features of the landscape.
- Third Dimension: perspective presentation enables far greater understanding of the design.
- Flexibility: design is flexible to changing conditions and information

Costs of Integrated Visual Design:

- Planning: more time and effort may be required up front for data collection, analysis and design and public / agency review prior to first pass harvest.
- Technology: more GIS / simulation tools are needed to show relationship between plan and perspective.
- Layout: irregular boundaries may take more time, but GPS may offset this concern.
- Harvest Systems: harvest costs may increase to accommodate more diverse unit configurations and silvicultural systems (partial cuts, patch cuts, leave tree strategies...)

Challenges in Applying IVD:

- Long term thinking is needed: to consider forest structure and activities over 80 or 100 years rather than 5 or 10 years.
- Larger perspective: have to take a step back from the cutblock and look at the context.
- Legislation: focus is on short term planning and cut control at operational level.
- Familiarity with new tools: the "voodoo" of working in perspective, analyzing landforms and features.
- Layout and harvest methods: implications of more irregular shapes and leave tree strategies.

Final Thoughts

“The landscape we see is not a picture frozen in time only to be cherished and protected. Rather it is the continuing story of the earth itself where man, in concert with nature, shapes and reshapes the ever-changing picture which we see. In it we may read the hopes and priorities, the ambitions and errors, the craft and creativity of those who went before us. We must never forget that tomorrow it will reflect with brutal honesty the visions, values and endeavours of our own time, to those who follow us.”

Forest Certification and Aesthetics: Proposed Criteria and Indicators for Visible Stewardship

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Overview

- Why certify forests for aesthetics?
- How does certification deal with aesthetics now?
- How might certification incorporate aesthetics?
- Recommendations on aesthetic criteria and indicators: "visible stewardship"
- What do we conclude?

Why Certify Forests For Aesthetics?

- Motherhood & apple pie: a fundamental forest resource/social benefit
- Pragmatism: what happens when the public hates the look of a Certified Sustainable Forest?



ISO9000 Certification Brazil

Linking Sustainability to Aesthetics: *Do People Prefer Sustainable Landscapes?*

Peter Wall Institute

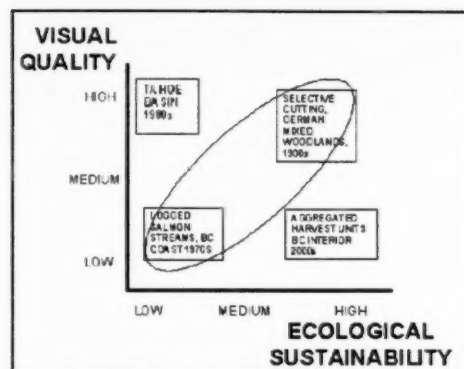
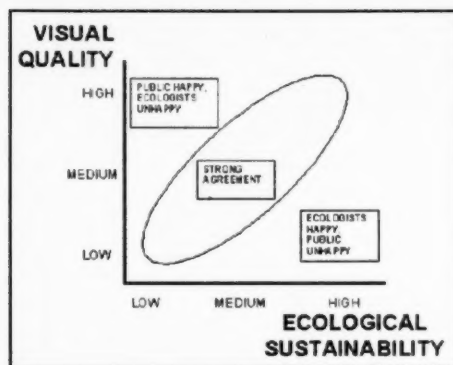
Exploratory Workshop

University of British Columbia,

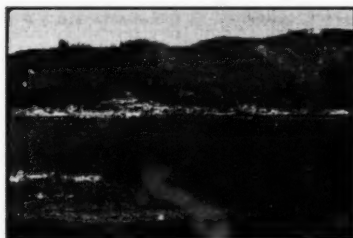
February 23-27, 1999

Some Workshop Findings

- Pragmatics: social indicators of sustainability (including aesthetics) are weakly represented in certification systems, relative to ecological indicators
- Fundamentals: not all indicators of ecological sustainability are visible
 - if it is good, it may not look good
 - if it is bad, it may not look bad



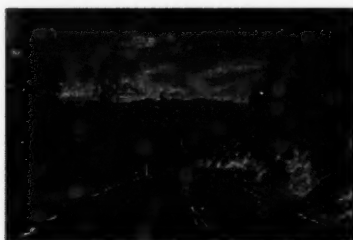
Examples of Sustainability/ Aesthetics Relations



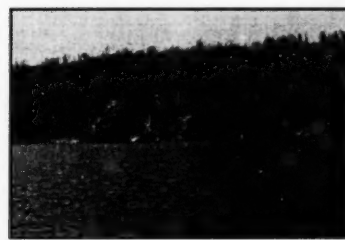
The forest ravaged: poor environmental practice and high visual impact



Looks good, is good: restored Ponderosa pine forest



Lake Tahoe: High scenic quality, poor forest health



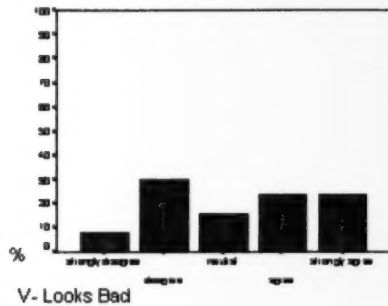
The forest visibly in poor health



Large scale "naturalistic" or "messy" disturbance: more sustainable, less aesthetic

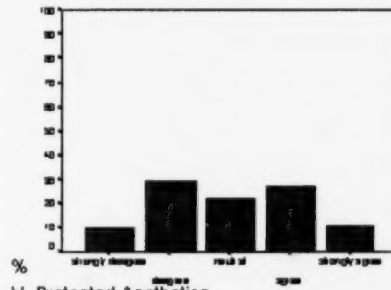
Arrow Forest District survey results - Do you agree with the following statements?:

"If it looks bad, it is ecologically bad"



V- Looks Bad

"If it is well managed ecologically, aesthetic values are protected"



V- Protected Aesthetics

DFO Best Practice

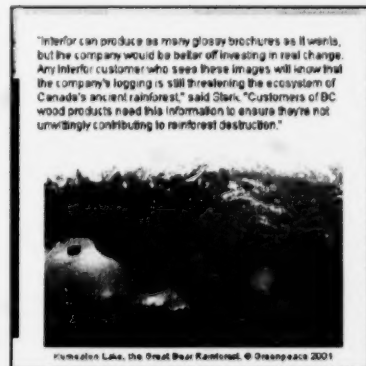
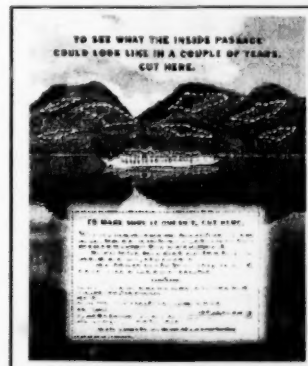


Design for Ecological and Spiritual Values

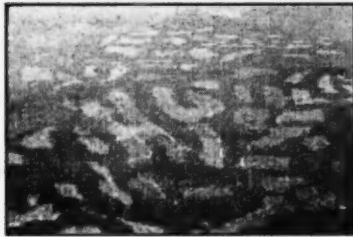


Possible Consequences of Ignoring Aesthetics in Certification

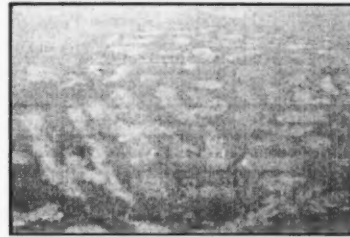
- Assessments biased by implicit aesthetic judgements?
- Managers of certified forests lulled into false sense of security
- Lack of public support for sustainable practices
- Good forestry has to be hidden from view
- Fodder for the ENGOS' media campaigns
- Non-timber economic opportunities forestalled



The Industrial Landscape



The Landscape As Message



Protecting Non-Timber Economic Values

- Tourism:
 - 83% of surveyed Vancouver Island tourist operators consider landscape viewing an essential component of their products (Clover Point Cartographics, 1997)
 - designated Scenic Byways generate \$30-35,000 per mile from non-residents each year (FHWA, 1990)
- Property Values: eg. Scottsdale wildfire led to 25%-40% drop in property values based on change in the view (Iverson, 1997)

Quality of life: eg. health benefits of naturalistic wooded surroundings and roadside scenery (Ulrich, 1997)

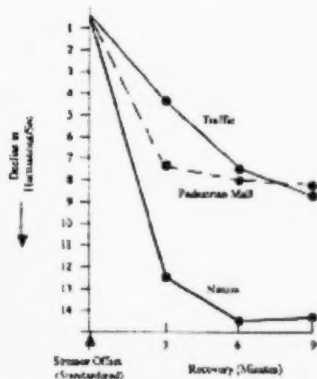
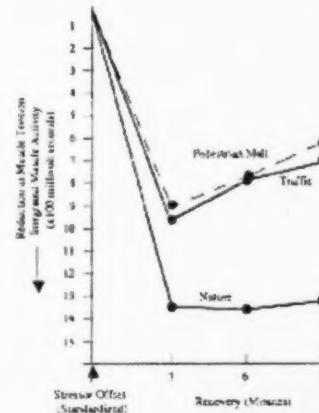


Figure 3. Skin conductance (SCR) during recovery from stress. (Ulrich and Simons, 1986)

Figure 4. Muscle tension (EMG) during recovery from stress. (Ulrich and Simons, 1986)



How Does Certification Deal with Aesthetics Now?

- Review of selected certification systems
- The few existing precedents for certifying aesthetic management
- Speculation on why aesthetics is so weakly represented

Criteria of Sustainability (adapted from Burley, 2000)

- Biodiversity (species diversity, landscape diversity)
- Productivity (of the ecosystem)
- Soil conservation (including erosion and natural hazards)
- Water conservation (including water quantity and water quality)

- Forest ecosystem health and vitality (ecosystem functioning)
- Contribution to global ecological cycles
- Ability of the forest ecosystem to fulfil socio-economic functions

The Forest Stewardship Council International Principles and Criteria:

Principle #1: Compliance with Laws and FSC Principles

Principle #2: Tenure and Use Rights and Responsibilities

Principle #3: Indigenous Peoples' Rights

Principle #4: Community Relations and Workers' Rights: Forest management operations shall maintain or enhance the long term social and economic well being of forest workers and local communities.

Principle #5: Benefits From the Forest: Forest management operations shall encourage the efficient use of the forest's multiple products and services to ensure economic viability and a wide range of environmental and social benefits.

Principle #6: Environmental Impact

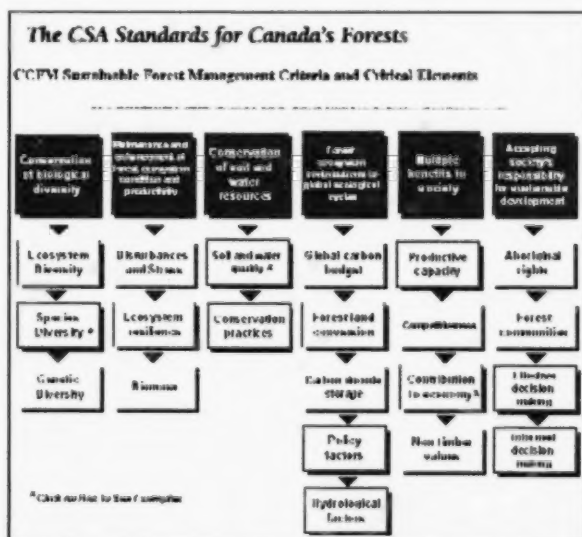
Principle #7: Management Plan

Principle #8: Monitoring and Assessment: Monitoring shall be conducted appropriate to the scale

and intensity of forest management to assess the condition of the forest, yields of forest products, chain of custody, management activities and their social and environmental impacts.

Principle #9: Maintenance of Natural Forests: Primarily forests, well developed secondary forests and sites of major environmental, social or cultural significance shall be conserved. Such areas shall not be replaced by tree plantations or other land uses.

Principle #10: Plantations: Plantations shall be planned and managed in accordance with Principles and Criteria 1 to 9, and Principle 10 and its criteria. While plantations can provide an array of social and economic benefits and can contribute to satisfying the world's need for forest products, they should complement the management of, reduce pressures on, and promote the restoration and conservation of natural forests.



Burley (2000), p. 97:

“for some criteria, no good quantitative indicators have yet been developed particularly for social benefits; aesthetic issues.... have not been considered seriously in any of the international processes.”

A place for aesthetics in Certification?

Source of Criteria and Indicators	Visual/Aesthetic C/I's Mentioned
Helsinki Process	No
Montreal Process	No
ISO 14000	No
Canadian Standards Association	No
FSC International	No
FSC Pacific Northwest	No
Smartwood BC	No
FSC UK	Yes
UK Forestry Standard	Yes

Socio-economic indicators of sustainability (adapted from Burley, 2000)

- Cultural, social and spiritual needs and values
 - area and % of forest managed for cultural needs
 - non-consumptive-use of forest values
 - area and % of forest used for supporting local employment
- Participation among stakeholders

Other precedents (adapted from Burley, 2000)

CIFOR (1998) “best bets” on social indicators include:

- a means of conflict resolution
- equitable benefit sharing
- children educated about natural resource management
- indigenous people maintain spiritual links to the land and their familiar landscape features



Criteria from the UK Forestry Standard, 1998

- Forest soil condition
- Water quality, yield, and discharge patterns
- Net carbon sequestration and air pollution
- Timber and wood production
- Nature conservation in and around forests
- Forest workforce competence and safety
- Social use and participation in sustainable forest management
- Historic, cultural, and aesthetic use of forests

Cultural & Aesthetic Use Indicators- The UK Forestry Standard, 1998 - (adapted from Burley, 2000)

National Level:

- The conduct of surveys and registers of ancient monuments
- Reporting on damage to ancient monuments
- The determination of woodland aspects of countryside character and landscape assessments
- The completion of survey reports for special areas such as National Parks

Forest Management Unit Level:

- Important sites are clearly recorded
- Sound principles for integrating archaeological sites in woodland are adopted
- Archaeological sites are protected and damage avoided
- Landscape principles of forest design are used
- Cultural and historical character is considered

Findings on aesthetics in certification to date

- Usually missing or not explicitly addressed
- Inconsistently applied within particular certification systems
- Few precedents are available
- Visual resource management and perception survey techniques not used

Why are aesthetic criteria so weak?

- Lack of training in certifiers
- Culture of hard science as the only real science
- Exclusion/ignorance of other trained disciplines

VRM means VOODOO RESOURCE MANAGEMENT

How Might Certification Incorporate Aesthetics?

- Relevant policy/cultural context (BC)
- Precedents from other criteria and indicators
- Principles from VRM

Forest Practices Board Review of the FDP Process

Highlights:

- Manage the full range of resources
- Need earlier and more effective public involvement, with more inclusive, respectful processes
- Need more transparency of the process (show the influence of public input)

Types of C & I's

- Intent-based: often vague expressions of general goals
- Procedural: are the following tasks carried out?
- Performance-based: are the desired levels of sustainability indicators achieved?

Possible intent-based C&Is

- Respect aesthetic and spiritual values
- Take into account natural landscape features
- Minimize impacts on scenery-related use values, eg. tourism

Possible procedural C&Is:

- Landscape design/VR assessment procedure in place
- Public input on visual sensitivity/aesthetic issues obtained
- Evaluation of VQO compliance
- Visualization used to communicate future forest conditions
- Qualified landscape foresters/ landscape architects employed

Possible performance-based C&Is

- Meet VQOs
- Achieve natural appearance
- Achieve socially acceptable appearance
- Maintain satisfactory recreational experiences



What Aesthetic Criteria and Indicators Do We Recommend?

- Principles of visible stewardship

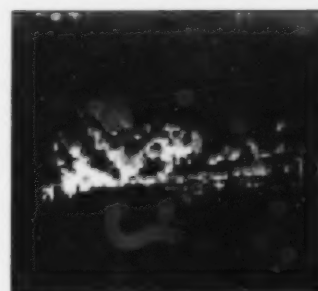
Premise: We find aesthetic those landscapes which clearly show people's care for and attachment to a particular place

Implication: Forest management will not be perceived as good forestry if it fails to express an obvious and sustained commitment of real people to the places under their control.

Business As Usual



Visible Stewardship



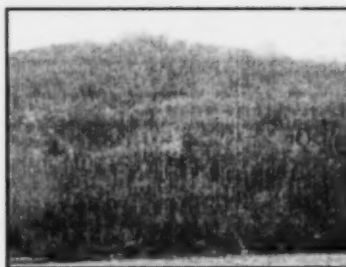
Visible stewardship principles

- Design to look sensitive: landscape as message: "cues to care"
- Keep forestry continuously visible
- Specific individuals prominent in the community, charged with long-term responsibilities for landscape management

- Local people involved in an inclusive planning/learning process

Example: Timfor's coastal operation, seen from Knight Inlet a certified sustainable landscape:

- 60%+ slopes
- 60% BAR
- Meets VQOs
- Eco-tourists happy
- Cheaper than heli-logging



View from a landing: 5 to 12 meter radial strips, with thinning between strips



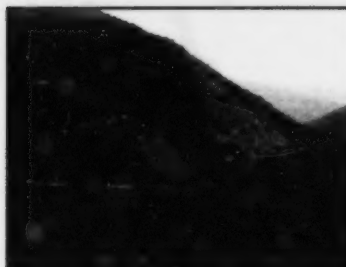
"Timfor CTRS (Contractors):
Selective logging, changing with our
Forests. Call Inlet".



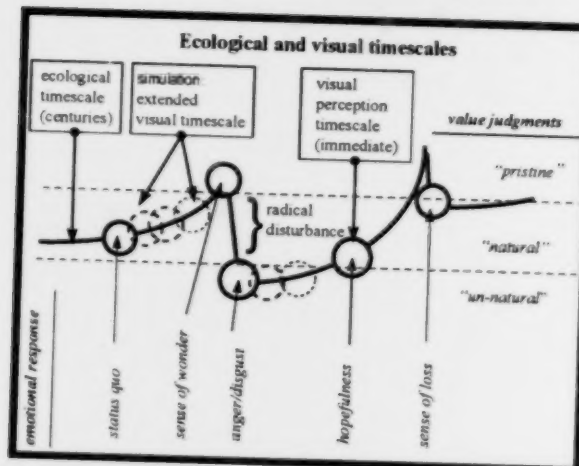
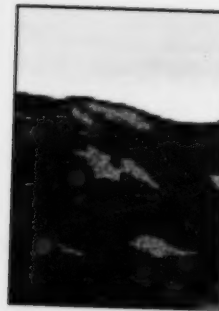
Visually acceptable patterns



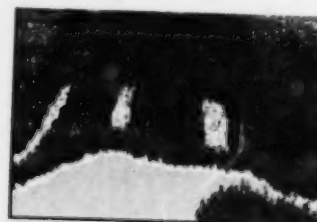
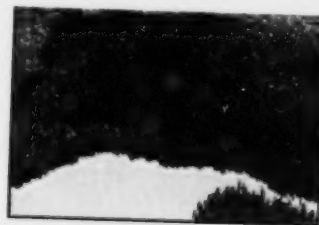
Different patterns under
standard FPC application



"Pillsbury Doughboy"



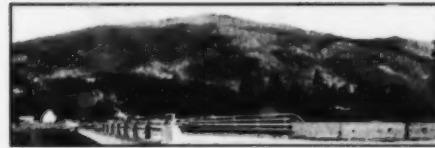
Shelterwood strip-harvesting over 80 years - Alex Fraser Research Forest



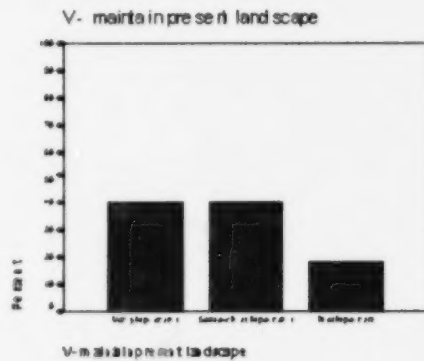
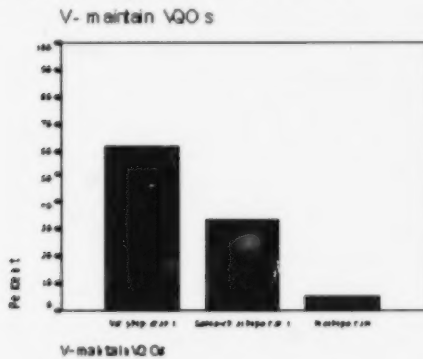


Back to the front-country

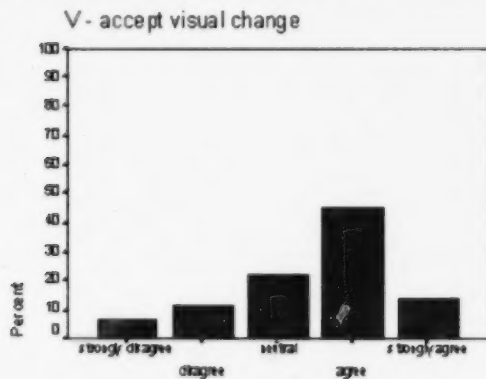
Areas like this (seen from Slocan City) contain about one third of the merchantable timber in the Lemon Landscape Unit.



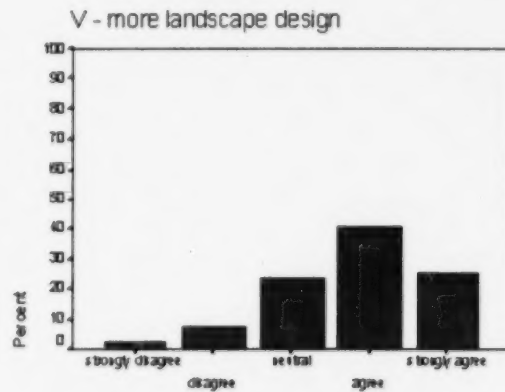
Arrow Survey Results on Visuals



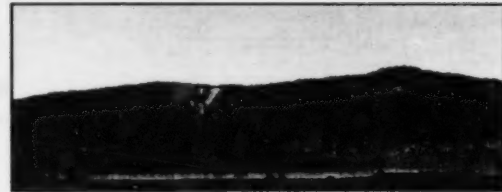
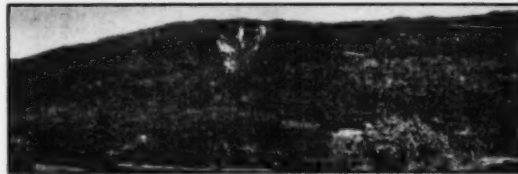
Accept some visual change in front-country if reducing ecological impacts in back-country



More landscape design should be applied to forest management



Ringrose Face (Retention VQO), seen from road to Valhalla Park.

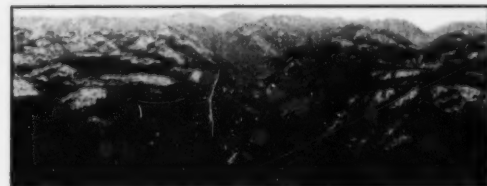
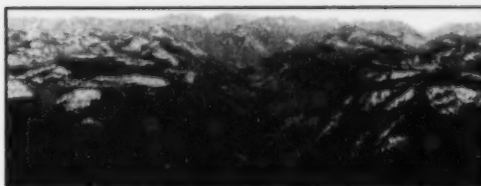


CALP Simulation

What Do We Conclude?

- Most current certification systems deal inadequately with aesthetics/public perceptions
- More robust, specific, and meaningful aesthetic criteria/indicators would help avoid conflicts and improve learning
- Visible stewardship principles should be tested in practice and considered in certification processes

Broaden our perspectives, look to the future



“Making the Working Forest Work in the Bigger Picture” “Looking at the Trees and Beyond”

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Good morning ladies and gentlemen, I am pleased to be here to be able to share some of my thoughts relative to visual resource management. I was intrigued by the overall theme of the conference, “Looking Beyond the Trees” and even more so with the concept of “Visual Stewardship of the Working Forest”.

The words “looking” and “visual” indicate to me that when planners are designing visual options that they indeed are hoping to create a “pleasing” picture. I borrowed a quote from Jim Unger, the creator of Herman, which I think captures the possible objectives of visual resource management.

“The artist, knowing that beauty is perceived in the eye of the beholder, strives by whatever means, to broaden the perception of others in the hope that they will share his joy.”

- Jim Unger, from *The Second Herman Treasury*

But before I share my thoughts on visual resource management, I think it is worthwhile to take a few minutes to give you an overview of the forest industry from a coastal vantage point. Then I will briefly talk about visual resource management and some of my thoughts as to why we are where we are today. Finally I will toss out some challenges to you because I truly believe some of the existing approaches to forest policy, including visual rules, have to change and change significantly in the “working forest.” This approach will hopefully allow you to better understand where I am coming from within the context of “Making the Working Forest Work in the Bigger Picture.”



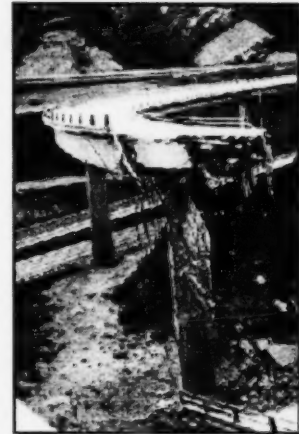
And just maybe it will help us collectively focus on just exactly what this “big picture” might look like. It all comes down to personal likes and dislikes.

Now lets start with the current health of the Coast Forest Industry.

The slide depiction is not too far off when trying to describe the direction of British Columbia's Coastal forest sector in the short term. We are facing and attempting to deal with problems of crisis proportions.

We continue to have a near fatal economy in our key Japanese market, and a demand for dry versus green product for our major coastal species – hemlock.

We continue to have to deal with the US market place or lack there of with the recent expiry of the Softwood Lumber Agreement. Earlier this month the US Coalition Lobby demanded that the US Commerce Department impose in excess of 70 percent in duties through countervail and anti-dumping measures.



The coast continues to be in the spotlight and seemingly only target for environmental groups in our domestic and international markets. There may be a temporary truce in the Central Coast, but I assure you the devil is in the detail and it appears the detail is open-ended for at least the next two years. The track record of environmental groups on "staying in the tent" on land use agreements has not been unblemished but this deal will now test their accountability and commitment at the global levels. (Last week Forest Action Network not in the tent.)

The Central Coast agreement may appease certain groups for the short term but I am cautious in my optimism remembering UBC's Fred Bunnell's, ominous prediction sometime ago. He said regardless of what we do, and how much we change, we will continue to have protests in BC to halt logging until the last tree is protected, because we have too many trees and too much old growth relative to most other parts of the world. I hope he is proven wrong.

These escalating demands for protected areas and escalating demands on the remaining "working" forest have resulted in a falling Allowable Annual Cut (AAC). In the last decade the coastal AAC has dropped by 24 percent and the crown timber harvest has dropped even more.

Escalating costs in all aspects of our business have made the coast the highest cost producer of fibre in the world. The 85 percent increase in costs over the last eight years could not be sustained by any business.

Inadequate return on capital employed has led to chronically inadequate investment resulting in declining employment opportunities, uncertainty in forest dependent communities and a weakened provincial economy.

To be blunt the BC Coast is in serious economic crisis. Unless we make some reasoned and radical repairs we will continue to falter with an ailing forest sector and a weak provincial economy. The repairs include replacing our pricing system with one that is market responsive, modernizing our rules of practice, and re-configuring our industry to match market place demands.

You might be wondering why I am talking about economics, protected areas and the like, when the theme of this conference is visual stewardship of the “working forest”. There is no direct linkage, right?

Nothing could be further from the truth. Public policy in the last decade has been a reactive response to multiple demands on forests. The outcomes, including visual resource management requirements, have resulted in a significant increase in areas protected from timber harvesting and a mind set, that the so called remaining “working forest”, must provide a basket of products, including as an afterthought, timber from every hectare of land.

The announced Central Coast framework agreement for instance, has put in motion the full protection of 600,000 hectares, with an option to protect another 537,000 hectares – “eminent scientists will determine what logging if any will take place”. In addition, special visual quality objectives for forest harvesting have been assigned in the interim to another 190,000 plus hectares.

This approach has provided opportunities to manage visual rules as we currently do, but as already noted, over time it has led to reduced timber supply and in some cases net timber values have been entirely eliminated. These results suggest there is an urgent need to seriously question the current approach in managing forest and non-forest resources on our forest lands in the “working forest”.

I think it's worth a few minutes to reflect where we are relative to protected areas and working forests on the coast. Before the Central Coast announcement, the coast had already overachieved on the 12 percent PAS provincial target. We have set aside over 2.2 million hectares or 13.3 percent of our Coastal land base in protected areas.

With the added areas of the Central Coast initiative, protected areas will at a minimum increase to 2.8 million hectares or 16.7 percent. If the option areas are deemed “off-limits”, the Coastal protected area could increase to 3.3 million hectares, or over 20 percent, and growing. To put the scale of protected areas on the coast into perspective, again excluding areas proposed in the Central Coast have a look at the next slide ...

In contrast, the coast “working forest”, which I equate to the timber harvesting land base the chief forester utilized to determine the last round of AAC's, is just under 3 million hectares, or 17 percent of the land base, and shrinking.

We must have a clear understanding as to what we mean when we talk about the “working forest”. What does it mean to most people? Who and what is it working for?

Protected Area Strategy (PAS) - Provincial

Target Set in Project 12 - of Province

How Close to Target Are We on The Coast?

Coast Areas in Hectares	Total	Protected	Percent
Coastal Forest	4,071,400	522,700	12.8
Urban Forest	2,261,400	400,000	17.6
Urban Woodlot	4,147,000	717,000	17.3
Forest Cover	7,742,200	1,639,700	21.2
Coastal Forest	1,954,100	2,490,000	22.5
Coastal Forest	13,614,000	2,490,000	18.3
Total Coastal Land Base	15,769,400	2,490,000	15.8
Province (including forest) and	14,801,000		13.3

Coast Protected Areas In Perspective

More than 11 percent of Coast Crown land currently protected

Now 12.2 Million Hectares Protected (including 100%)

Coast Protected Area Represents an area that is approximately:

- one and a half times the size of Prince Edward Island, or
- over 90% of the total forest lands of British Columbia, or
- more than double the area of the Crown (Timber) lands, or
- approximately 60% of Vancouver Island (study island), or
- over 50% of Vancouver Island (study island), or
- over 20% of the public land area of Alberta.

Crown Forest Land Area Available for Commercial Forestry

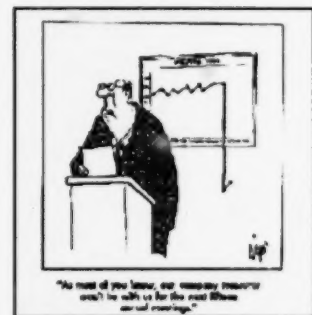
Category	Area (hectares)
Forest Land Available for Commercial Forestry	2,800,000
Forest Land Available for Commercial Forestry (including 100%)	3,300,000
Forest Land Available for Commercial Forestry (including 100%) (including 100%)	3,300,000
Forest Land Available for Commercial Forestry (including 100%) (including 100%) (including 100%)	3,300,000

Or more importantly is it working? Some of you may recall that a few years ago the chief forester directed Ministry of Forests staff to review the visual resource management rules. The objective was to get a 2 per cent timber supply "buy back" to ensure the Forest Practices Code impact across the province was limited to 6 per cent. Did the process work? In talking to some field foresters the response I got was it did not. Yes there were reviews and changes to scenic areas and visual classes, but overall when push came to shove, on the ground, we got back



Some would respond by saying so what. We do not have to concern ourselves with impacts on timber supply or the health of the forest industry - tourism and high tech are growing and will soon replace the forest industry as the economic engine of the province.

I do not think I have to spend a lot of time talking about high tech and the fate of dot.com wonders. NASDAQ performance of late speaks for itself. I understand Bill Gate's net worth dropped \$39 billion in the last few weeks.



When it comes to tourism there are some myths that we have to get our heads around as to why we are practicing visual resource management to the degree we are in many parts of the coast, particularly in the working forest.

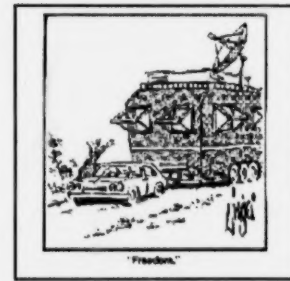
A recent Vancouver Sun article titled "Province's Tourism Operators Brace for Sluggish Growth" should sound warning bells. COTA president Kevin Walker noted the tourism industry is fragile now with a few exceptions, the Whistler area is strong and specialty sectors like heli-skiing are also optimistic.

Interestingly COTA has an extensive wish list for boosting the industry throughout BC:

- More funding for tourism marketing
- More flexible labour regulations
- Improved transportation networks in the province
- Less red tape
- Lower taxes.

The list is not that dissimilar from what might make the forest sector once again globally competitive and note it does not mention that an increase in visual resource management is required or that visual resource management is even a consideration. Neither does it indicate that more constraining retention levels are required.

It might surprise you that in the same article it was noted that the greatest boost to the tourism industry would be a resurgence in the BC economy since anywhere from 40 to 60 percent of hotel room occupancy is driven by BC residents travelling through the province. Many of the remainder are doubtless avid wilderness consumers like these folks.



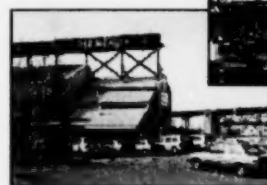
All kidding aside, a healthy forest sector combined with a healthy tourism sector would definitely go a long ways in providing a much-needed boost to our economy. This fact has not been lost on either sector as the Council of Tourism Associations and Council of Forest Industries penned an MOU to work towards the attainment of each others objectives, recognizing there is a lot of commonality in the two sectors.

But the biggest revelation to me was in big black bold text in a sub article that **“Mountains and water are not enough”**. David Baxter, executive director of the Urban Futures Institute noted that:

- BC can no longer rely on its sheer natural beauty to attract more and more visitors every year.
- Tourism is about selling stories and experiences and giving people something to talk about when they go back home.
- Images of Super Natural BC are trees, rocks and water. These are nice images but you can't tell a lot of stories about them.
- You have to be able to talk about our restaurants and art galleries and other experiences.

He went on to say that tourism competes in a global market and people who think about coming here can also look at Paris, or London or Sydney. Sound familiar.

Now I have to stop and ask are we not in part doing visual resource management for the benefit of tourism, or are we just going through the motions to hide logging?



As an example - because we have a remarkable and extensive coastline, much of it forested, we are constraining vast areas for visuals, because of perceived values associated with the Inside Passage cruise ship industry.



I do not know if many of you are aware, but as a form of entertainment, the cruise-ship industry organizes speakers on topics of interest during the cruise. Each speaker gets a free ride (at least a drastic discount) for two to three talks per cruise. When I found out about this from a friend, I contacted one of the firms that arranges speakers, "Posh Talks" out of Palm Springs, to see if I could swing a discounted cruise and talk about the BC coast and the coast industry, because I worked most of that Coastline area back in the 70's.

The response floored me, and it should get some landscape planners to rethink visual management and why we do it to the scale that we do.

The lady I talked to, quite matter of factly, told me they were not interested. They were not interested to have their cruise passengers hear about BC. Now if I could build my talks around fauna and biota of Alaska, I was a shoo-in, because as the lady said, they are in the business of marketing Alaska, not BC.

Now if they are not interested in facts about BC, why would they be out-of-sorts in what the BC coast looks like from the deck of a cruise ship, as it winds its way through the inside passage, a large amount of the time, I might add, in the dark!?

Just one more example as to why we should give our heads a shake. Just recently the CFLA was notified of public meetings commencing for the sea-to-sky land and resource management plan. The primary goal of the sea-to-sky LRMP is to balance and integrate the use of land outside of parks and protected areas - for those of you not aware 22 per cent of the Squamish forest district is already protected.

No doubt a big focus of some of the stakeholders to be included in the process will be to protect the rich and famous from being visually assaulted by cut blocks as they speed up and down from Vancouver to Whistler. What's lost in this picture is that these same people are spending hundreds of dollars a day to ski down long clear cuts that are not allowed to grow back as new forests. A good example of perception and value differences. A lot of these people tend to have close encounters of their own whether it's on the ski slopes or highways.



As with anything visual, the beauty or lack thereof is in the eye of the beholder. Some landscapes are appealing to the eye while others are not. It greatly depends on whose eyes are doing the viewing.

Patrick Moore has said visual perceptions of what is beautiful - and right - about a landscape are not innate but are learned from regular exposure to ideas and images that are portrayed in a certain light. The conviction that it is wrong to cut forests at all is easily linked to the perception of visual offensiveness.



In the case of forest management it all comes down to attitudes. Specific attitudes and opinions about forest management are developed from emotionally charged beliefs about what is desirable, right and appropriate. For instance you may have heard the phrase "It's not that I'm against logging, I just don't want to see it." Why would someone respond like this?

I believe it's because the public in BC and in our international markets have been saturated with carefully selected images. Most notably pictures of large clear cuts from a previous era, and pictures of the "last" pristine forest valleys, and endless emotive rhetoric that harshly condemned BC's forest policies and the behaviour of specific forest companies.

In general we humans have reflective thought and can always reason our way out of a problem. Or maybe not. In the case of access to our coastal forests, rationale human thought has been lost to the lobby of the entrenched. Government and industry alike have done a dismal job of messaging, and truly a disservice to our proud forest heritage.

We have been like lemmings, led over the cliff on this one, in the guise of needed change. We have with our policies and rules adopted an approach that has bought into the argument that changes to the landscape through logging are ugly, and will remain so in time. That is, what we do in the working forest through forest management, even though we are world leaders in forest stewardship and in setting aside vast areas for generations to come, must be hidden from the public. In this case, using visual landscape techniques, the objective appears to be to hide or buffer the work ongoing in the working forest.

We should not lose site of the fact that forests and forested landscapes are not static, they do change, and change can be dramatic, and what looks good today, can overnight become ugly, and in several years be looking pretty good again.

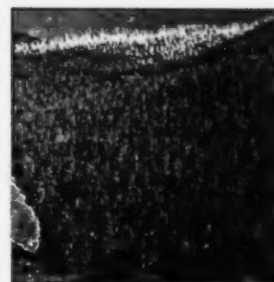
UBC's Hamish Kimmins notes that much of the public opposition to logging and clearcutting in particular has arisen because of the distasteful appearance of clearcuts in the immediate post harvest state. He notes that unfortunately these concerns have become confused with the more persistent and ultimately more important issue of environmental degradation. Further he says people care very much about how forested environments look, regardless of the environment's ecological condition.

Kimmins notes that because humans are a very highly visual species – we make profound judgements about the condition and desirability of our environment on the basis of visual impressions. "The larger, the more dramatic and the less aesthetic the change in the environment, the more people tend to assume that the environment has been damaged.

He concludes that "beautiful" [forest] stands and landscapes are not necessarily sustainable. Sustainable stands and landscapes are not always "beautiful" all the time.

He continues "perhaps the classic case of the aesthetic "beast" turning into beauty is a clear cut... {[which] can, and frequently does, result in beautiful second growth forests..

In contrast, partial harvesting without adequate disturbance can, in some forest types, promote a forest that is maladapted to the climate, has a high incidence of parasites and diseases, and has reduced levels of biodiversity. Trying to find that balance will be difficult, but our industry is working on it.



In the end, we should be seriously considering what message we are giving the public, domestic and international, by hiding our activities on the working forest.

I can't recall where I read it, but there was a statement made that public opposition to clear cutting and logging is symptomatic of public alienation from forestry.

If this is true and if efforts to influence public policy are based on perception and persuasion not science or facts, are our visual management rules not further alienating our publics?



In this province public policy is usually determined by those that show up to persuade, and by policy makers asking the "right" questions. I'm sure the slide must remind those of you involved with the large crowds that come out for FDP reviews.

I would suggest that when it comes to visual resource management it's all about perception and very subjective values rather than shade tolerance needs, economics of logging or even environmental protection. Interestingly I am not aware of any recent or ongoing studies done in BC on landscape preferences, and if there are any, in what context survey questions would have been asked.



Needless to say the response of public policy decisions on the coast has been to significantly increase the area protected from logging and to practice visual management on many areas that further constrains timber supply. In the case of visual resources management we have tended to use a rules based approach designed to retain default stand volume rather than to retain certain landscape elements in order to make it appear that the landscape has been unaltered. By so doing we have residualized commercial timber production.

An alternative approach would be turn visual resource management on its ear in the working forest where if I am not mistaken, intensive timber management was originally meant to be a key objective. Such a system may actually provide for non-timber values more effectively while softening the blow of AAC reductions in the short term and increasing sustainable timber

harvests above current levels in the longer term. To conclude I come back to the theme of the conference - "looking beyond the trees".

I would suggest this should be broadened to "looking at the trees and beyond". In other words, any visual management plan should capture the full range of age classes to compliment the preservation of visual values in the protected areas.

The Europeans, in fact, do just that. I am amazed at the pride people have in showing off their forests. In Germany for instance they have what is called a "volks-march" where every weekend you can hike through the forest on a 5 or 10 kilometer route and have a beer and bratwurst at the end. These hikes are through working forests comprised of many age classes, and, believe it or not, clearcuts.

Here in BC, however, as I have stated earlier, we go out of our way to hide our industrial use of resources as if we are carrying out untoward practices. We should be showing off what we do well, and de-mystify many of the allegations we tend to be tainted with. We should, in this province where we are blessed with such a wonderful renewable resource, be proud to show off the truly working forest. It is time to start thinking outside of the box - because the box we are in is a coffin.

If you saw a hippopotamus and everyone around you convinced you it was a racehorse, you'd think it was a pretty ugly racehorse. Taken one step further, if they convinced you it was a French poodle, it would be even uglier. In fact, it was probably a pretty nifty hippo. So that's what I do in Herman. I draw the hippos. They're really quite lovable.

A new philosophy is needed. One that recognizes the value of our working forests and pays attention to the value of scenic areas. One that is driven in a more "visible", systematic and objective manner, rather than a cookie cutter approach. We need to rethink how we deal with visual objectives in balance with our economic and social objectives. We need to rethink why we use visual management to hide the activities of one of our key economic drivers, when we could be using visual management techniques to create an opportunity to rebuild a wood culture in this province. The one we have is obviously not linked to the forests, nor is it environmentally friendly.

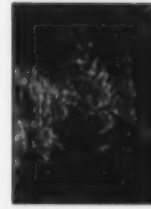


Government and industry are in our markets to reaffirm to our customers that we are carrying out world leading forest practices, but at home we focus on hiding all our activities, so that our customers can sell the product in a visually pleasing environment such as



Home Depot locations and the like, each take up 6 hectares - that's the size of twelve football fields - of once what was forest or farmland. They tend to remain as paved parking lots housing one of the most environmentally unfriendly beasts - cars.

As I mentioned earlier we tend to forget that cut blocks, clearcut, or otherwise tend to grow back without too much difficulty and can be very visually pleasing.



So in closing I challenge you to rethink how we manage visual resources in the working forest.

Ask yourself just what values are we showing or, what values are we not showing.

I just want to leave you with these three questions:



- What is wrong with this picture from a tourism perspective?
- What is wrong with this picture from an environmental perspective?
- What is wrong with this picture from a loggers perspective?

Simple answer for all three – nothing, this is BC at its best.

The picture shows a hiker enjoying a thunderous waterfall, flanked by a natural landslide.

It comes down to a matter of attitude or perception and built in values.

A line in one of Bob Dylan's songs goes something like - "When you ain't got nothing, you've got nothing to lose".

Let's not lose the remaining working forest that we have. I challenge you to "look at the trees, and beyond".

Assessing the Non-Timber Value of Forests: A Revealed Preference, Hedonic Model

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Abstract

Based on revealed preference theory, the value of non-timber goods and services obtained by forest owners, private or public, should be at least equal to the difference between the value of what they could have cut had they tried to maximize timber revenues, and of what they actually cut. This definition was applied to estimate the non-timber value (NTV) of Forest Inventory and Analysis plots in the Wisconsin maple-birch forest type, with a Markov decision model to predict the decision that would have maximized the timber income. Then hedonic regression was applied to determine how the biophysical characteristics of stands and the socioeconomic setting influenced NTV. In the Wisconsin maple-birch forests, the NTV was highest for national forests: about \$50 ha⁻¹ yr⁻¹, ten times the timber revenues. The estimated NTV was similar for all non-national forests, at about \$20 to \$24 ha⁻¹ yr⁻¹. For non-national public forests, NTVs were four times larger than timber revenues. They were almost twice as large as timber revenues for private non-industrial forests. Even for industry forests, NTVs were slightly higher than timber revenues. However, these NTVs could be biased due to constraints limiting the potential economic return from forest stands not reflected by the profit-maximizing model. The hedonic pricing model showed that stands with the same tree distribution had significantly higher NTVs for national forests, and similar NTVs for other ownership types. The marginal value of trees of various species and size was also different for national forests. At constant prices, from 1966 to 1984, the non-timber value of maple-birch forests in Wisconsin increased by 30% for national forests, and 55% for other forests.

Introduction

Forests are valuable for timber production, and as sources of other goods and services: landscape aesthetics, wildlife habitat and preservation of biodiversity, carbon sequestration, ground water purification, production and conservation of topsoil, and oxygen release. Prices and quantities exchanged do not exist for most of these "non-market" goods. Yet, their value to consumers and producers can be high, and neglecting them would lead to inferior policies and decisions, due to the type of market failure analyzed extensively in the public good literature (Laffont 1998). On

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the production side, the non-cash character of the services that the owner obtains from the stock of trees makes it difficult to incorporate them explicitly in timber supply analysis. Yet, the presence of recreational or other services provided by a standing forest has an important effect on when and whether to harvest (Hartman 1976, Strang 1983). The object of this paper is to try to derive non-timber values from "revealed preferences", that is actual choices of forest owners for different management outcomes. This approach is, then, symmetric and complementary of Hartman-Strang's. While they showed the theoretical consequences of non-timber values on when trees would be cut, we attempted instead to infer empirically the non-timber value from the way owners did or did not cut their trees.

Both revealed and stated preference methods of evaluating non-market goods have been researched extensively in the past twenty years (Freeman 1993). In particular, the role of non-timber values has long been recognized in the theory of optimal harvesting decisions (Hartman 1976, Bowes and Krutilla 1985). Some authors argue for enhancing these values from social equity considerations (Reiling and Anderson 1985, Tomkins 1990). Compelling empirical evidence exists supporting the relevance of these values to woodland owners. In their 1986 report on small private woodland owners in Wisconsin, Roberts *et al.* found that timber production only ranked 7th among the reasons to own woodland, while 69% of the responses ranked "scenic enjoyment" first or second and 74% gave the same rank to "wildlife habitat". A more recent survey of Wisconsin private forestland owners (Birch 1994) found that amongst the reasons for woodland ownership, "recreation" and "aesthetic enjoyment", ranked consistently higher than timber production.

Much of the published work has been aimed at deriving non-timber values for benefit-cost analysis. Revealed preference methods, especially based on travel costs, have been used in a number of studies. The earliest estimated the effects of forest quality on demand for recreational activities such as camping, hiking, hunting, visiting resorts etc. (Michaelson, 1975; Moeller *et al.* 1977; Leuschner and Young, 1978; Wilman, 1984; Crocker, 1985; Brookshire and Coursey, 1987). Sorg and Loomis (1984) review the early literature. McCollum *et al.* (1990) investigated the recreational values of national forests, and Englin and Mendelsohn (1991) applied a travel cost hedonic pricing approach to value the recreational benefits of forest landscapes in the Pacific Northwest. Willis (1991) used travel cost functions to derive the recreational value of the Forest Commission estates in the United Kingdom, and Bateman *et al.* (1996) applied similar methods to Welsh forests and used the results to infer the non-timber values of reforestation activities in England. Dennis (1989) related harvesting behavior to forest characteristics in a theoretical model that can also accommodate non-timber values. Recently, Lee (1997) derived non-timber values for owners of even-aged forests in the southern United States, with hedonic discrete choice models.

Non-timber values have also been derived by contingent valuation. Walsh *et al.* (1989, 1990), and Loomis *et al.* (1994) estimated the public willingness to pay to protect forests from insects and fires. Similar techniques have been used to estimate the value of forest landscapes (Holms and Kramer 1995, Mattson and Li 1995) and of forest recreation (Scarpa *et al.* 2000). These studies corroborate the hypothesis that non-timber benefits are substantial, and may exceed timber revenues (Lockwood *et al.* 1992).

The objective of this paper is to propose a method to estimate non-timber value, and its determinants based on revealed preferences. The method is then applied to maple-birch forests in Wisconsin. Maple-birch forests cover about one third of the 5.7 million hectares of commercial forest in this State (Smith, 1986). They are, therefore, a salient feature of the local

landscape and economy. The forests are very diverse in terms of species and structure, containing more than 55 species of trees of various sizes (Lin *et al.*, 1996). The premise of this paper is that the value of this diversity and of other forest traits to the owners can be inferred from their harvesting decisions. Specifically, non-timber value is defined as the difference between what owners actually cut from their stands, and what they could have gotten had they been profit maximizers. This non-timber value is estimated for each of 610 USDA Forest Service permanent plots in Wisconsin (Hahn and Hansen, 1985; Hansen *et al.* 1994), allowing for an assessment of the magnitude and distribution of non-timber value by ownership. Then, hedonic pricing methods are applied to estimate the non-timber value of trees by species and size, conditional on other characteristics of the stand and of the owner that might influence non-timber value. Lastly, the hedonic price equations are used to estimate the non-timber rewards garnered by the owners of the stands measured in the 1966 and 1984 inventories.

Theory

The unit under consideration is a forest stand: a homogeneous management unit of varying size but typically less than 10 ha. The theory involves two aspects. First, defining the monetary worth of the total non-timber value embedded in a forest stand, from the principle of revealed preference. Second, finding the contribution of each stand characteristic to this non-timber value, by hedonic pricing theory.

Harvest Choice and Timber Versus Non-Timber Values:

Forest owners are assumed to prefer some combinations of forest stand states and timber revenues. For uneven-aged stands, the state is represented concisely by the number of trees of different size and species per unit of land, i.e. the tree distribution.

Let $\mathbf{Y}=[y_{ij}]$ be a $(1 \times n)$ vector representing this tree distribution at the time of the harvesting decision, y_{ij} being the number of trees of species i and size j . Let $\mathbf{H}=[h_{ij}]$ be the number of trees to be cut from $\mathbf{Y}$, and sold at prices $\mathbf{p}=[p_{ij}]$. Then, $\mathbf{S} = \mathbf{Y} - \mathbf{H}$ is what is left standing to produce current and future timber and other benefits. We assume that owners try to maximize their utility, over an infinite horizon. For each stand, observed over a given time length, this choice results in an actual harvest $\mathbf{H}^0$, and an actual residual stand, $\mathbf{S}^0$.

Without markets for non-timber goods and services, if owners only cared about monetary returns, they would maximize the net present value of timber benefits by choosing $(\mathbf{H}^*, \mathbf{S}^*)$. But, most owners also enjoy non-timber benefits from the standing trees, and the observed vectors $(\mathbf{H}^0, \mathbf{S}^0)$ account for them. The observed decision reflects a trade-off between timber revenues and non-timber, usually non-monetary, rewards. For expected utility maximizers who benefit from both timber and non-timber we expect $\mathbf{H}^0 < \mathbf{H}^*$, and $\mathbf{S}^0 > \mathbf{S}^*$.

Lacking direct observations on what owners would have cut, had they tried to maximize timber revenues, these must be inferred with a model. For example, to derive an infinite horizon optimal timber-harvesting rule Lin and Buongiorno (1998) define N possible stand and market states. For every state i there is an optimal decision k^* , solution of N recursive equations (Ross, 1983):

$$V_i^{t+1} = \max_k [r(i, k) + d \sum_{j=1}^N p(j | k) V_j^t] \quad i = 1, \dots, N; t = 1, \dots, \infty \quad (1)$$

where V^t is the present value of the timber income over t years, i and k are combinations of stand and market states (price levels), $r(i, k)$ is the immediate timber return from cutting a stand from

state i to state k , $p(j|k)$ is the probability of moving from state k to state j , and d is the discount factor. To each state i corresponds a price and a tree distribution $\mathbf{Y}$. A decision means cutting the stand from state i to state k , corresponding to $\mathbf{S} = \mathbf{Y} - \mathbf{H}$. The best decision is unique and depends only on the stand state and price level. Lin and Buongiorno (1998) give the decision matrix and the corresponding optimum rewards $r(i, k^*)$.

However, forest owners with utility for non-timber values would not solve problem (1), but one with a reward function that includes timber benefits $r(i, k)$ and non-timber benefits, $r'(i, k)$. Needed is a description of the non-timber benefits function $r'(i, k)$. We seek answers to two questions. First, how much are non-timber benefits worth in money terms, for a stand left in state k ? Second, how much does each characteristic of the stand in state k contribute to non-timber value. Precisely, what is the marginal value, or implicit price, of each stand characteristic in terms of non-timber benefits?

Revealed-Preference Measure of Non-Timber Value

Let the utility derived by owners from their observed choice of post-harvest state k^0 be:

$$U^0 = U(\mathbf{S}^0, \mathbf{pH}^0), \quad (2)$$

a monotonically increasing function of its arguments, while the utility they would have gotten by maximizing net present value, choosing state k^* , is:

$$U^* = U(\mathbf{S}^*, \mathbf{pH}^*). \quad (3)$$

For owners who chose the bundle $(\mathbf{S}^0, \mathbf{pH}^0)$ when $(\mathbf{S}^*, \mathbf{pH}^*)$ was available we say that the first was "revealed preferred" to the second. Thus, by definition of the utility function:

$$U^0 \geq U^*. \quad (4)$$

The proposed measure of non-timber benefits is the timber revenue foregone for the sake of gaining the non-timber benefits associated with leaving $\mathbf{S}^0 - \mathbf{S}^*$ standing:

$$NTV = \mathbf{p}(\mathbf{H}^* - \mathbf{H}^0) = \mathbf{p}(\mathbf{S}^0 - \mathbf{S}^*) > 0 \quad (5)$$

That the state $(\mathbf{H}^0, \mathbf{S}^0)$ is revealed at least as good as $(\mathbf{H}^*, \mathbf{S}^*)$ implies that:

$$U(\mathbf{S}^0, \mathbf{pH}^0) \geq U(\mathbf{S}^*, \mathbf{pH}^0 + NTV). \quad (6)$$

Therefore, the NTV defined as the timber revenue foregone by the owner is a lower bound on the non-timber benefits expressed in monetary terms. This NTV is also a lower bound for the compensating variation (CV), the amount that would have to be paid to timber owners in addition to the timber income $\mathbf{pH}^0$ to compensate them for having to accept the state $(\mathbf{S}^*, \mathbf{H}^*)$ when $(\mathbf{S}^0, \mathbf{H}^0)$ was available.

In terms of the decision model (1) the timber-revenue maximizing return obtained by cutting from state i to state k^* is $r(i, k^*)$. Although few if any owner may use the specific model (1) to compute the profit-maximizing harvest, the maintained rational expectation hypothesis is that they use all the information they have optimally. They may make occasional mistakes, but not systematically (Gordon 1993 p. 184). The NTV of the stand in pre harvest-state i , and post-harvest state k^0 is then:

$$r'(i, k^0) = r(i, k^*) - r(i, k^0), \quad (7)$$

which is the opportunity cost of choosing state k^0 , rather than stand state k^* . It is natural to assume that the non-timber (amenity) value of the stand depends mainly on the remaining trees, i.e. on the post-harvest state, k^0 , so that $r'(i, k^0) = r'(k^0)$, independently of the pre-harvest state, i . Given an estimate of the non-timber value of a stand state, the next step is to determine the marginal NTV of each stand characteristic. Thus, for each characteristic, we seek a price

defining its contribution to the non-timber value. In particular, for each tree species and size, we seek a non-timber vector $\mathbf{p}'$ analog to the timber price vector $\mathbf{p}$.

Determinants of Non-Timber Value

Non-timber benefits of forests are heterogeneous goods tied to a bundle of forest characteristics $\mathbf{X}$, defined in part by the residual stand state, k . In general, attributes such as accessibility of the forest, number, size and species diversity of trees may enhance non-timber benefits directly (large trees enhancing the aesthetics of a forest stand), or indirectly (diversity of tree size enhancing wildlife habitat and thus hunting, bird-watching, scenic beauty). Woodland owners are mostly price-takers with respect to stumpage price so, at the moment of the harvesting decision, they can be thought of as timber suppliers in a competitive environment. Forest owners also have a demand schedule for the forest attributes which includes non-timber benefits. To be able to infer the values of forest stand characteristics to their owners, we assume that the timber market is in equilibrium, that is, that owners have made their utility-maximizing production choice given the price of timber and other goods and services, and that these prices clear markets. Under this assumption, the NTV of a stand is a function of its characteristics (Freeman 1993 p. 371) which can be priced by hedonic methods (Rosen 1974). The hedonic function is a regression of NTV on $\mathbf{X}$ that decomposes NTV into the contribution of each characteristic in $\mathbf{X}$.

While amenity values depend partly on "intrinsic" attributes such as the species and size of trees, they also depend on the socioeconomic setting (Bockstael, 1996). For instance, other things being equal, in densely populated regions with wealthy households, the demand for recreational services of forests should be comparatively higher, making NTV higher. Especially critical is the forest ownership: The NTV on national forests should be much higher than on industry forests, because of markedly different management objectives. There, the NTV measures how much timber income the public has been willing to forego for other benefits. The concept of forest attributes was therefore extended to include such "extrinsic" indicators. The general hedonic model has the form :

$$NTV = NTV(\mathbf{X}, \mathbf{Z}) \quad (8)$$

where $\mathbf{Z}$ is a vector of socioeconomic indicators. The coefficient of each forest attribute of the vector $\mathbf{X}$, in the regression (8) is its hedonic price, while the coefficients of the socioeconomic attributes are shifters of the hedonic function.

Estimating the Non-Timber Value of FIA Plots

The data were drawn from 610 plots representative of the entire maple-birch forest type in Wisconsin, obtained from the USDA Forest Service, Forest Inventory and Analysis (FIA) database (Hansen *et al.* 1994). A plot consists of a cluster of 10 sample points, uniformly distributed over 0.4 ha (Hansen and Hahn 1992). Each plot was taken as representative of a stand, it had detailed data on the number, size and species of trees, type of terrain, and some data on location and ownership. The plots were measured twice between 1966 and 1984, at intervals between 6 and 16 years (average 13 years). The drawbacks of the FIA plots are their limited area, and incomplete information on the variables that might influence timber and non-timber values. The advantages are that there are many of them, measured in the same way, and that growth models and profit-maximizing rules have already been developed from the same plots (Lin and Buongiorno 1998).

The first step was to estimate for each plot what the owners should have done, had they sought to maximize timber revenues. This was inferred from the optimal decision rule described in Lin and Buongiorno (1998), based on model (1). In Lin and Buongiorno's model, the forest stand states are defined by the basal area (high or low) of trees in each of three size classes (pole, small, and large sawtimber), in two species groups defined by shade tolerance. Altogether there are 64 possible stand states and 2 possible market states (high or low price). This makes for 128 stand-market states. For each state the decision rule indicates to which other state the stand should be cut to maximize the expected net present value of timber revenues, over an infinite time horizon. Applied to each FIA plot, this rule gave an estimate of the timber revenue ($\$ \text{ha}^{-1} \text{yr}^{-1}$) that would be obtained by an owner acting to maximize timber revenue only, and who placed no value on non-timber benefits.

The FIA plot data also contain information on the trees that were actually cut by the owner between the two inventories. From these, we estimated the value of the harvest ($\$ \text{ha}^{-1} \text{yr}^{-1}$), with the same prices used to find the decision that would have maximized the net present value of timber. Because the time of the harvest was unknown, the average price between the two inventories was applied.

Then, the difference between the value of the profit-maximizing harvest and that of the actual harvest gave the non-timber value ($\$ \text{ha}^{-1} \text{yr}^{-1}$): our estimate of the monetary value of the flow of services generated by the stand of trees left after harvest. This is what the owner gave up, presumably to gain the amenity values inherent in the stand left after harvest.

Table 1 presents summary statistics for observed harvest, potential harvest and NTV, by type of ownership. The average potential harvest, i.e. the harvest that would have maximized revenues ranged from \$25 and \$55 $\text{ha}^{-1} \text{yr}^{-1}$. It was largest for national forests, and lowest for other public forests. It was intermediate, and about the same for industry and other private forests. These differences reflect the different management objectives, and also differences in forest productivity. In particular, other public forests (state, county and municipal) tend to be on poorer sites.

The actual harvest across ownership ranged from \$5 to \$19 $\text{ha}^{-1} \text{yr}^{-1}$. It was highest for industry forests, intermediate for other private forests, and lowest for national and other public forests. The non-timber value, defined as the difference between potential and actual timber revenues, was highest for national forests: about \$50 $\text{ha}^{-1} \text{yr}^{-1}$, ten times the timber revenues². The estimated non-timber value was similar in all non-national forests, at about \$20 to \$24 $\text{ha}^{-1} \text{yr}^{-1}$. For non-national public forests, non-timber values were four times larger than timber revenues. They were almost twice as large as timber revenues for private non-industrial forests. Even for industrial forests, non-timber values were slightly higher than timber revenues.

Figure 1 shows the distribution of forest area, harvest, and non-timber value in the entire maple-birch forest type of Wisconsin, based on the FIA plots weighed by the area that each plot is meant to stand for (its area expansion factor). Nearly half of the total area belonged to non-industrial private forest owners. They contributed more than half of the total harvest, and 35% of the estimated non-timber value. National forests that had 20% of the forest area contributed 40% of the non-timber value, as defined here, and less than 10% of the harvest. For industrial forest, the situation was reversed, contributing 30% of the timber harvest, and 15% of the non-timber

²The difference in NTV estimates between national and other forests reflects largely differences in the utility functions. While public forest management should reflect the preferences of the entire citizenry, private forests tend to be managed more according to the preferences of their owners.

value on less than 20% of the land area. Non-national public lands contributed equally to timber and non-timber values, less than 10% each, on 15% of the land.

The estimated NTVs of ten percent of the plots were negative: the cut was larger than what the net-present value-maximizing rule prescribed. However, negative NTVs were clustered near zero, in agreement with profit maximizing behavior (figure 2). Slightly negative NTVs, or positive ones for that matter, may be due to a profit maximizer's imperfect knowledge, or/and different objective functions (for example, higher discount rates), or errors in trying to maximize net present value. Also, there were stands that were not cut and for which the profit maximizing decision was not to cut. In those cases, 9% of the plots, the NTV was zero by definition, as the decision was consistent with maximizing timber profit. Therefore, the plots with $NTV \leq 0$ were maintained in the analysis. Still, for the few plots of zero NTV, this was clearly a lower bound because they could have some residual amenity values. In addition, the 19% of plots with $NTV \leq 0$ led to heteroskedastic residuals, which had to be recognized in estimating the hedonic price equation.

Potential Determinants of Non-Timber Value

The hypothesis is that three categories of variables influence the non-timber value of each forest stand represented by an FIA plot: the ecological attributes of the stand, its physical location, and its socioeconomic context. This led to the following potential explanatory variables:

Stand structure and diversity:

Other things being equal, the NTV of a stand should depend on its ecological condition, after harvest since it is the residual stand that generates the amenity values. The stand was described by the number of trees in three species groups: Tolerant, mid-tolerant, and intolerant, and in three size classes: pole, small saw timber, and large saw timber (Lin *et al.* 1996). We expected larger trees to have larger marginal NTV since they contribute greatly to the beauty and biological diversity of forests.

Another hypothesis was that NTVs would be influenced by the ecological diversity of stands. For lack of measures of total biological diversity, indices of tree diversity were used. Stands with high diversity of tree species and size can provide preferable wildlife habitat (Ambuel and Temple 1983, Hunter 1990, Burton *et al.* 1992). Diversity of stand structure also enhances the perception of scenic beauty (Ammer 1994). Thus, high tree diversity should increase NTV. With Shannon's index (Pielou, 1975), we measured for each plot the diversity of species H_{sp} and of size H_{sz} , with 55 distinct species and 12 size classes (Lin *et al.* 1996). The average size diversity of stands in public forests was higher than in private forests, the size diversity of industry stands was particularly low, due to the absence of large trees. However, industrial stands had slightly higher average species diversity, but the difference across ownership was not statistically significant.

Because the striking colors of foliage in the fall is a feature of Wisconsin's north woods, we tried to quantify this with a Shannon index of color diversity H_{COL} , based on 4 chromatic classes (Little 1995).

Site characteristics:

From the FIA database, four site and location variables were available. The site index (SITE, in meters for maple at age 50 years), was expected to have a positive effect on NTV since a high site index means the potential to grow large handsome trees of different species, with attendant

biome. The distance of the stand from water (DWATR, in km) was expected to have a negative effect on its NTV, reflecting lower recreational value. The average percentage of the deviation from the horizontal over the plot (SLOPE) was to have a positive effect on NTV because hilly areas tend to be aesthetically pleasing. Roads could have different effects on NTV. Bostedt and Mattsson (1995) find that more roads increase non-timber values, plausibly by making forests accessible to more people. But, greater distance from roads (DROAD) could also make a stand more attractive for wilderness uses, thus increasing NTV. In addition, greater distance to road and slope could have decreased actual harvest, thus increasing NTV as computed here.

Socioeconomic variables:

Among the socioeconomic variables that might affect the NTV of a stand, ownership type is probably one of the most important, as suggested by the summary statistics in Table 1. The FIA database recognizes several ownership categories, which were grouped into four: National forests, identified by the dummy variable NAT, other public forests (i.e. state, county and municipal forests, PUB), industrial forests, IND, and other private forests, OTH. One would expect NTV to be lowest on industrial forests, corresponding to a more profit driven type of management.

Spatial socioeconomic interactions may affect environmental externalities (Bockstael, 1996). To describe the socioeconomic environment of a stand we used population density (POP, inhabitants km^{-2}) of the county in which each FIA plot was located, and the average household income of that county (INC, in thousands of 1976 \$ yr^{-1}). Both were obtained from The State of Wisconsin Blue Book (various years), for the middle year between the two inventories. Other things being equal, higher local income and population were expected to increase the demand for amenities from the forest (by the owner and by others), and thus to increase the non-timber value.

Hedonic Model of Non-Timber Value

The conditional mean NTV was estimated with a linear regression model:

$$NTV|X,Z = \beta'(X,Z) + \varepsilon \quad (9)$$

Where ε is an uncorrelated, homoskedastic and i.i.d. error term with zero expected value. This model was meant to decompose the total expected NTV of a stand into linearly additive parts, the contribution of each stand variable. Each regression coefficient could therefore be interpreted as the marginal contribution to NTV of the variable, that is, the hedonic price of the characteristic that the variable measured (Rosen, 1974).

Model estimation began by including all of the theoretically relevant, and available, variables. This long regression was then "tested down" to a parsimonious model with only statistically significant variables (Kennedy, 1993). As noted above, the distribution of the NTV suggested that the residuals would be heteroskedastic, and this was confirmed by various tests (Glejser 1969, White 1980, Greene 1993). In the following results, the standard errors were estimated with White's estimators (1980), which is robust to a general form of unknown heteroskedasticity³.

³ Full generalized least squares was also tried, with the following model of the residuals variance:

$$\sigma^2 = \alpha + \beta H_{tot} + \gamma NAT. \quad (12)$$

Which assumed that the variance of the residuals was higher for stands of higher diversity, and on national forests. The results confirmed this expectation. However, the results for the NTV model (11) were very close to the OLS results, although they had smaller variance. OLS with White's heteroskedasticity correction was preferred because it did not require a specific form of the error function.

The results of estimation of model (9), with all the potential variables, are in table 2. Among the stand variables, the number of trees of various sizes and species had the highest statistical significance, and most had the expected positive sign. Diversity of species or size did not seem to influence NTV, possibly because the information on diversity was already present in the data on number of trees by species and size. Of the site variables, the site index, distance to water, and distance from road had coefficients of plausible signs, but none was significantly different from zero. Among the socioeconomic variables, only the dummy variable indicating ownership to a national forest (NAT) seemed to matter. A stand in a national forest had an expected non-timber value $\$22 \text{ ha}^{-1}\text{yr}^{-1}$ higher than stands in other types of ownership. There was no significant difference among the other ownership.

A parsimonious, more efficient, model of NTV was then estimated by eliminating the variables that were not significantly different from zero at the 5% level. The results (table 2) gave a coefficient of determination about equal to that of the long regression. Moreover, an F-test on the restrictions of the parsimonious model gave $F(13,582) = 0.72$, $P\text{-value} = 0.75$, so that the hypothesis that the omitted coefficients were zero was acceptable. The remaining coefficients were similar in the long and short regressions. There was a strong correlation between tree size and non-timber value. For example, the marginal contribution to NTV of a large sawtimber tree of shade-tolerant species was about $\$1.20$ per year, four times that of a small sawtimber tree. At equal size, trees of mid-tolerant species tended to have larger non-timber values than those of other species.

This and other interpretations of the results are subject to the caveat that the NTV computed should be a lower bound on non-timber value. Furthermore, these estimates of NTV may be biased due to the omission of important variables affecting owners' behavior. Keeping this in mind, the higher NTV on national forests suggested that the hedonic price of different trees might also be different. This was tested by estimating two models, for the plots in national forests, and for others (table 3). A Chow test confirmed that the coefficients were significantly different, after allowing for a different constant. The model for non-national forests had a slightly better fit than that for the pooled data, and it confirmed the strong positive correlation between tree size and marginal NTV. But the model for national forests was worse, with imprecise hedonic prices for three tree categories.

The hedonic price models of table 3 were applied to compute the contribution of different tree categories to harvest and non-timber value in Wisconsin maple birch forests, during the time between the two inventories. The first column of table 4 shows the non-timber value generated by the average hectare of national forests, at the time of the first inventory, circa 1966, net of the harvest taken between the two inventories. Of the NTV of $\$50 \text{ ha}^{-1}\text{yr}^{-1}$, 70% came from the stock of trees, mostly shade tolerant and mid-tolerant, the rest from unidentified sources independent of the number of trees and reflected by the constant in table 3. On non-national forests, 90% of the NTV of $\$22 \text{ ha}^{-1}\text{yr}^{-1}$ could be attributed to the stock of trees. On national forests, the value of the average annual harvest was one-tenth that of the non-timber value. For other forests, it was about half. Between the two inventories, the non-timber value, at constant prices, increased by 30% for national forests, and by 55% for other forests. Most species and sizes of trees contributed to this increase.

Summary and Conclusion

The first part of this paper proposed as an aggregate measure of the non-timber value of a forest stand, the difference between what owners, public or private, could have gotten by maximizing timber revenues, and what they actually got. As theorized, this revealed willingness to pay should be a lower bound of the non-timber value. This definition was then applied to estimate the non-timber value of all FIA plots in the Wisconsin maple-birch forests, based on the actual harvest and on the result of a Markov decision model predicting the decision that would have maximized the timber income. The last part of the paper used hedonic regression to determine how the biophysical characteristics of stands, and the socioeconomic setting, influenced their non-timber value.

For the Wisconsin maple-birch forests, the non-timber value was highest on national forests: about $\$50 \text{ ha}^{-1}\text{yr}^{-1}$, ten times the timber revenues. This is a lower bound on what the public has been willing to give up to enjoy the amenities provided by standing trees on national forests, exclusive of other direct public expenditures to manage them. Average non-timber values were similar in all non-national forests, at about $\$20$ to $\$24 \text{ ha}^{-1}\text{yr}^{-1}$, four times the timber revenues. NTVs were almost twice as large as timber revenues for private non-industrial forests. Even for industrial forests, non-timber values were slightly higher than timber revenues. This may seem high, but non-timber values for industrial forests are varied and complex. They include the importance of the good public image that conservative management can bring to corporations, and the avoidance of litigation, with subsequent constraining laws, for the preservation of environmental values. Industry may find it cheaper to be its own regulator, for example by employing foresters with a strong land ethic who try to preserve non-timber values.

Still, these estimates of non-timber value are preliminary. They assume that owners would have harvested according to the revenue optimization model, had they been pure profit maximizers. It is possible, however, that constraints independent of amenity values could lead owners to harvest less or more. For example, industrial owners might harvest less than the land-rent maximizing amount to maintain a regular supply, or because of attitudes towards risks, or imperfect knowledge. Or, private owners with capital rationing constraints might harvest more than what the model predicts with a conservative rate of interest of 3% per year (Lin and Buongiorno 1998).

The hedonic pricing model that predicted NTV from stand characteristics and socioeconomic variables had modest explanatory power. More variables on the owner characteristics could be used in future studies. Nevertheless, the present model gave plausible estimates of the marginal NTV of trees of different species and size, especially for non-national forests. Stands with the same tree distribution had significantly higher NTVs in national forests, but similar NTVs in other ownership. The marginal value of trees of various species and size was also different in national forests. With these hedonic prices, from 1966 to 1984, the non-timber value of maple-birch forests in Wisconsin increased by 30% in national forests, and 55% in other forests. The revealed preference method proposed here could be useful in environmental accounting to derive lower bounds on non-timber value on a regional, and perhaps national scale. The method could be applied to other forest types and regions of the United States, since it uses almost exclusively the FIA data, available nationally, and updated regularly⁴. It does require a model to

⁴ The empirical part of this paper has dealt with the estimation of non-timber revenues and prices at a given point in time, but the method could be used to monitor changes in prices of non-timber benefits over time as well, in parallel with the updating of the FIA data.

predict the timber-revenue maximizing decision, given current stand condition. But several models of this kind are available, and the model used here was itself developed from FIA data, so that it could be calibrated for other regions. Nevertheless, more must be learned about how the prescriptions of such profit maximizing models are affected by owners' specific circumstances, such as risk aversion and capital or timber-flow constraints. Somewhat paradoxically, this revealed-preference approach to non-timber valuation requires the best possible knowledge of the economics of pure timber production.

Further improvements of the hedonic price function for non-timber values should be possible. It would be useful to get more detailed information on the socioeconomic characteristics of the owners and of their property, which may affect both the potential timber income, and the non-timber value. For example, information on whether or not owners recreate on their own land, the presence of peculiarly attractive scenery visible from the forests, and the amount of dead wood present to support biodiversity could all affect NTV's. The present method is grounded in the concept of revealed preference. But, what owners prefer depends critically on what they can do and who they are. Better quality data should ultimately better explain how owners choose between timber and other forest benefits. With these caveats, the approach seems worth pursuing as an alternative or complement to contingent valuation and related non-market valuation methods.

Literature Cited

- Ambuel, B. and S.A. Temple. 1983. Area-dependent changes in the bird communities and vegetation of S. Wisconsin forests. *Ecology* 64(5):1057-68.
- Ammer, O. 1994. Let's take a walk in the woods. *Naturoipa* (75):8.
- Bateman, I.J., G.D. Garrod, J.S. Brainard, and A.A. Lovett. 1996. Measurement, valuation and estimation issues in the travel cost method: a GIS approach. *Journal of Agricultural Economics* 47(2):191-205.
- Birch, T.W. 1994. Private forest-land owners of the Northern United States. USDA For. Serv. Res. Bul. NE-136.
- Bockstael, N. 1996. Modeling economics and ecology: the importance of a spatial perspective. *American Journal of Agricultural Economics* 78:1168-1180.
- Bostedt, G. and L. Mattsson. 1995. The value of forests for tourism in Sweden. *Annals of Tourism Research* 22:671-80.
- Bowes, M.D. and J. Krutilla. 1985. Multiple-use management of public forestlands. P. 531-569 in *Handbook of Natural Resource and Energy Economics, Volume II*, Kneese, A.V. and J.L. Sweeney, (eds.). Elsevier, New York.
- Brookshire, D.S. and D.L. Coursey, 1987. Measuring the value of a public good: an empirical comparison of elicitation procedures. *American Economic Review* 77:827-566.
- Bureau of Economic Analysis. 1994. *Economic-Environmental Accounts*, USA Department of Commerce, Washington DC.
- Burton, P.J., A.C. Balisky, L.P. Coward, S.G. Cumming, and D.D. Kneeshaw. 1992. The value of managing for biodiversity. *The Forest Chronicle* 68(2):225-237.
- Cobb, C. and T. Halstead. 1994. *The genuine progress indicator: survey of data and methodology*. Redefining Progress, San Francisco.
- Crocker, T.D. 1985. On the value of the condition of a forest stock, *Land Economics* 61:244-254.
- Dennis, D.F. 1989. An economic analysis of harvest behavior: integrating forest and ownership characteristics. *Forest Science* 30(3):687-704.
- Englin, J. and R. Mendelsohn. 1991. A hedonic travel cost analysis for valuation of multiple components of site quality: the recreation value of forest management. *Journal of Environmental Economics and Management* 21(3):275-90.
- Freeman, A.M. III. 1993. *The measurement of environmental and resource values: theory and methods*. Resources for the future, Washington DC.
- Glejser, H. 1969. A new test for heteroskedasticity. *Journal of the American Statistical Association* 64:316-23.
- Gordon, R.J. 1993. *Macroeconomics*. Sixth Edition. Harper Collins. 580p.
- Greene, W.H. 1993. *Econometric Analysis*, Macmillan, New York.
- Hahn, J.T., and M.H. Hansen. 1985. Data bases for forest inventory in the North Central Region. USDA Forest Service Gen. Tech. Report. NC-101.

- Hansen, M.H., and J.T. Hahn. 1992. Determining stocking, forest type, and stand-size class from forest inventory data. *NJAF* 9:82-88.
- Hansen, M.H., T. Frieswyk, J.F. Glover, and J.F. Kelly. 1994. The Eastwide Forest Inventory Data Base: Users Manual. North Central Station's Forest Inventory and Analysis Unit, St. Paul, Minnesota.
- Hartman, R. 1976. The harvesting decision when a standing forest has value. *Economic Enquiry* 14:52-58.
- Holmes, T.P. and R.A. Kramer. 1995. An independent sample test of yea-saying and starting-point bias in dichotomous-choice contingent valuation. *Journal of Environmental Economics and Management* 29:121-32.
- Hunter, M.L. Jr. 1990. *Wildlife, forests and forestry: principles of managing forests for biodiversity*. Prentice Hall, NJ.
- Kennedy, P. 1993. *A guide to econometrics*. The MIT Press, Cambridge, Massachusetts.
- Laffont, J.J. 1998. *Fundamentals of public economics*. The MIT Press, Cambridge, Massachusetts.
- Lee, K. 1997. Hedonic estimation of private forest amenity values and an application to natural resource accounting. Ph.D. dissertation, North Carolina State University, Raleigh.
- Leuschner, W.A. and R.L. Young. 1978. Estimating the Southern pine beetle's impact on reservoir campsites. *Forest Science* 24:527-543.
- Lin, C.R. and J. Buongiorno. 1998. Tree diversity, landscape diversity, and economics of maple-birch forests: Implications of Markovian models. *Management Science* (forthcoming).
- Lin, C.R., J. Buongiorno, and M. Vasievich. 1996. A multi-species, density-dependent matrix growth model to predict tree diversity and income in northern hardwood stands. *Ecological Modeling* 91:193-211.
- Little, E.L. 1995. *National Audubon Society field guide to North American trees*. Knopf, Chanticleer Press, New York.
- Lockwood, M., J. Loomis, and T. Delacy. 1992. A Contingent Valuation survey and benefit-cost analysis of forest preservation in East Gippsland. *Journal of Environmental Management* 38:233-43.
- Loomis, J., A. Gonzales-Caban, and R. Gregory. 1994. Do reminder of substitutes and budget constraints influence contingent valuation estimates? *Land Economics* 70(4):499-506.
- Mattson, L. and C.Z. Li. 1995. How do different forest management practices affect the non-timber value of forests? An economic analysis. *Journal of Environmental Management* 40:79-88.
- McCollum, D.W., G.L. Peterson, J.R. Arnold, D.C. Markstrom, and D.M. Hellerstein. 1990. The net economic value of recreation on the national forests: twelve types of primary activity trips across nine forest regions. USDA For. Serv. Res. Rep. RM-289.
- Michaelson, E.L. 1975. Economic impact of pine beetle on outdoor recreation. *Southern Journal of Agricultural Economics* 7:42-50.

- Moeller, G.H., R.L. Marler, R.E. McCoy, and W.B. White. 1977. Economic analysis of the gypsy moth problem in the Northeast III. Impact on homeowners and recreation areas. USDA For. Serv. Res. Rep. NE-162.
- Pielou, E.C. 1975. Ecological diversity. John Wiley & Sons. New York.
- Reiling, S.D. and M.W. Anderson. 1985. Equity and efficiency in the public provision of forest-based recreation opportunities. *Journal of Environmental Management* 20:149-161.
- Roberts, J.C., T.G. Wayne, and H.C. Jordahl Jr. 1986. The Wisconsin Private non-industrial woodland owner: a profile. University of Wisconsin Cooperative Extension Service, Madison, WI.
- Rosen, S. 1974. Hedonic prices and implicit markets: product differentiation in perfect competition, *Journal of Political Economy* 82(1):34-55.
- Ross, S. 1983. Introduction to stochastic dynamic programming. Academic Press, New York.
- Scarpa, R., S. Chilton, G. Hutchinson, and J. Buongiorno. 2000. Valuing the recreational benefits from the creation of nature reserves in Irish forests. *Ecological Economics* (forthcoming).
- Smith, W.B. 1986. Wisconsin's fourth forest inventory area. USDA For. Ser. Res. Bull. NC-97.
- Sorg, C.F. and J.B. Loomis 1984. Empirical estimates of amenity forest values: a comparative review, USDA For. Ser. Gen. Tech. Rep. RM-107.
- Strang, W.J. 1983. On the optimal forest harvesting decision. *Econ. Inquiry* 21(4):576-83.
- The State of Wisconsin blue book. Legislative Reference Bureau. Madison, WI.
- Tomkins, J. 1990. Recreation and the Forestry Commission: the case for multiple-use resource management within public forestry in the U.K. *Journal of Environmental Management* 30:79-88.
- Walsh, R.G., F.A. Ward, and J.P. Olien. 1989. Recreational demand for trees in national forests. *Journal of Environmental Management* 28:255-268.
- Walsh, R.G., R.D. Bjorback, R.A. Aiken and D.H. Rosenthal. 1990. Estimating the public benefits of protecting forest quality. *Journal of Environmental Management* 30:175-189.
- White, H. 1980. A heteroskedasticity-consistent covariance matrix and a direct test for heteroskedasticity. *Econometrica* 48:817-38.
- Willis, K.G. 1991. The recreational value of the forestry commission estate in Great Britain: a Clawson-Knetsch travel cost analysis. *Scottish Journal of Political Economy* 38(1):58-75.
- Wilman, E.A. 1984. Benefits to deer hunters from forest management practices which provide deer habitat. P. 334-344 in 49th North American Wildlife and Natural Resource Conference, Wildlife Management Institute, Washington D.C.

Table 1. Potential and actual timber revenue and implicit non-timber value.

Value	Ownership	Mean	S.D.	Median	Max.	Min.	Plots
(1) Potential (\$ ha ⁻¹ yr ⁻¹)							
	National	55.1*	53.6	35.6	230.1	0.0	106
	Other public	25.4	24.0	19.0	136.0	0.0	95
	Industry	39.3	41.7	25.4	165.9	0.0	95
	Other private	36.8	45.4	19.0	295.3	0.0	314
(2) Actual (\$ ha ⁻¹ yr ⁻¹)							
	National	5.4	17.8	0.0	130.6	0.0	106
	Other public	5.2	13.3	0.0	83.5	0.0	95
	Industry	18.6	35.2	0.0	162.7	0.0	95
	Other private	13.3	28.6	0.0	255.8	0.0	314
(3) Non-timber value =(1)-(2) (\$ ha ⁻¹ yr ⁻¹)							
	National	49.6*	51.5	28.9	210.9	-8.9	106
	Other public	20.2	23.5	12.3	136.0	-5.2	95
	Industry	20.7	29.8	11.9	125.2	-25.4	95
	Other private	23.5	34.3	13.6	224.7	-55.6	314

(*) mean is significantly different from that of other owners at 5% significance level.

Table 2. Effect of variables on non-timber value (\$ ha⁻¹yr⁻¹).

Variables	Long regression		Short regression	
	Coef.	S.E.	Coef.	S.E.
Trees ha ⁻¹ :				
Shade tolerant:				
Pole	0.01	0.01		
Small saw	0.33 ***	0.05	0.32 ***	0.05
Large saw	1.18 ***	0.19	1.18 ***	0.19
Mid-tolerant:				
Pole	-0.00	0.02		
Small saw	0.51 ***	0.10	0.48 ***	0.10
Large saw	2.20 ***	0.34	2.21 ***	0.34
Intolerant:				
Pole	0.04 ***	0.01	0.03 ***	0.01
Small saw	0.23 ***	0.09	0.25 ***	0.09
Large saw	1.17 ***	0.32	1.02 ***	0.34
Diversity:				
H_{st}	-6.78	4.90		
H_{sp}	-2.79	3.27		
H_{COL}	2.36	5.39		
Site:				
SITE	0.01	0.29		
SLOPE	-0.13	0.11		
DWATR	-0.02	0.24		
DROAD	0.13	0.22		
Socioeconomic:				
NAT	21.82 ***	5.01	22.74 ***	4.07
PUB	1.07	3.59		
OTH	-0.52	2.85		
INCOME	-3.73	2.19		
POPDENS	0.08	0.08		
Constant	12.29	12.22	-1.28	1.74
R ²	0.49		0.48	

***, ** significant at 1% and at 5% level, respectively. S.E. = standard error.

R² = coefficient of determination, adjusted for degrees of freedom with 610 observations.

Table 3. Models of non-timber value for National and other forests (\$ ha⁻¹yr⁻¹).

Variables	National Forests (N=106)		Other Forests (N=504)	
	Coef.	S.E.	Coef.	S.E.
Trees ha ⁻¹ :				
Shade tolerant:				
Small saw	0.53 ***	0.16	0.26 ***	0.04
Large saw	1.59 **	0.81	1.11 ***	0.17
Mid tolerant:				
Small saw	0.89 **	0.42	0.38 ***	0.07
Large saw	0.80	1.45	2.37 ***	0.36
Intolerant:				
Pole	0.01	0.05	0.03 ***	0.01
Small saw	0.02	0.25	0.33 ***	0.08
Large saw	3.62 **	2.82	0.86 ***	0.32
Constant	15.13 ***	2.75	0.05	1.52
R ²	0.40		0.50	

***, ** significant at 1% and 5% level.

R²=coefficient of determination, adjusted for degrees of freedom.

Table 4. Source of the contribution of maple-birch stands to harvest and non-timber value (NTV).

Source:	National Forests			Other Forests		
	NTV	Harvest	NTV	NTV	Harvest	NTV
	1966	1966-1984	1984	1966	1966-1984	1984
	(\$ ha ⁻¹ yr ⁻¹)	(\$ ha ⁻¹ yr ⁻¹)	(\$ ha ⁻¹ yr ⁻¹)	(\$ ha ⁻¹ yr ⁻¹)	(\$ ha ⁻¹ yr ⁻¹)	(\$ ha ⁻¹ yr ⁻¹)
Trees ha ⁻¹ :						
Tolerant:						
Pole	0.0	0.5	0.0	0.0	0.7	0.0
Small saw	15.8	1.2	23.5	4.2	2.0	9.1
Large saw	7.7	2.0	10.4	8.9	4.0	7.7
Mid tolerant:						
Small saw	7.2	0.2	9.1	2.7	0.5	3.0
Large saw	1.5	0.0	2.0	3.0	1.5	4.4
Intolerant:						
Pole	0.5	0.7	0.5	0.0	0.7	2.5
Small saw	0.2	0.2	0.2	0.0	1.5	4.7
Large saw	2.0	0.2	3.7	1.2	1.7	1.5
Total from trees:	34.5	5.4	49.4	20.0	12.6	32.9
Others sources:	15.1		15.1	2.2		2.2
Total:	49.6	5.4	64.5	22.2	12.6	35.1

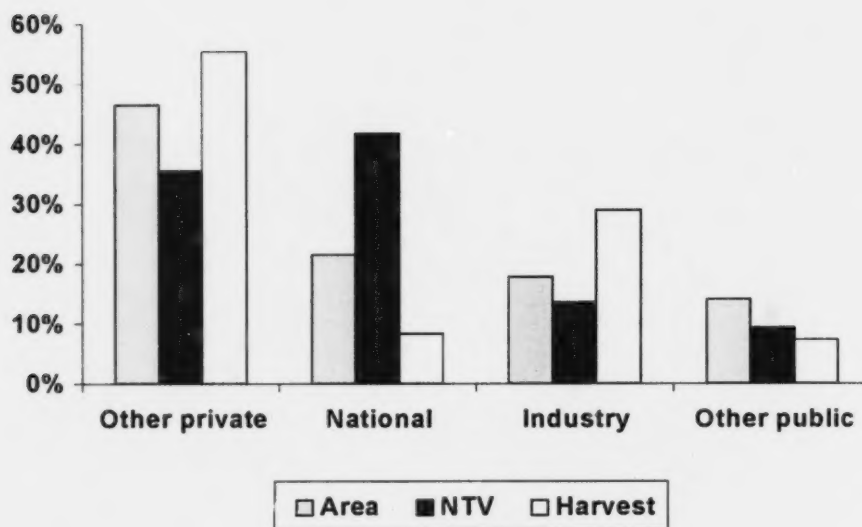


Figure 1. Distribution of non-timber value (NTV), area and harvest, by ownership.

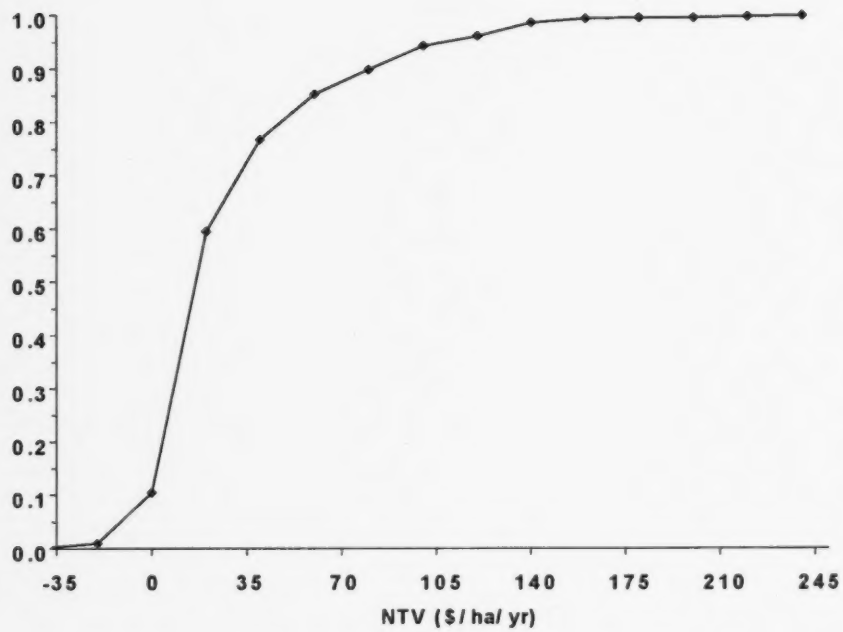


Figure 2. Cumulative distribution of non-timber values (NTV) on FIA plots.

Visual Resource Management Practitioners' Training and Skill Set Requirements

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Twenty years ago (in May 1981), the Forest Landscape Handbook was published in the province of British Columbia, based on pioneering concepts of the U.S. Forest Service. Simple visual landscape inventories spread across the province, rating only visual sensitivity and, later, visual absorption capability (VAC), existing visual condition (EVC), and visual quality objectives (VQOs). All the work, including assigning VQOs, was produced by a handful of "experts" who were required to have all the skills known at the time. Most of the skill set was gained through the trial and error approach of practice and experience building. In the early days (1980–85) there were no exact measures of success—no percent alteration limits, no real ability to interpret good design from less good. On-site discussions and training sessions encouraged visual impact mitigation and design improvements. Quality (beauty) was in the eye of the beholder. Industry and many Forest Service people viewed landscape management reluctantly as nice to do if it was practical, affordable and didn't limit timber harvesting.

In the later 1980s, guidelines were issued for planning processes, such as the Okanagan lakeshore guidelines and the interim landscape management guidelines for the Vancouver Forest Region (1990). Measures of success were developed, such as percent alteration limits in perspective view for VQOs, and Visually Effective Green-up guidelines. When VQOs became an element for input into timber supply analysis, visual landscape management became an important, identifiable and traceable commodity. Inventories documented 30% of the forest landbase as visually sensitive. By 1996, the restrictions on timber supply caused by visual constraints were deemed too onerous to carry out and were curtailed as part of an overall examination of the effects of the Forest Practices Code on timber supply. This analysis resulted in a 2% reduction of the impact on timber supply from VQOs in the province overall, and a 4% reduction in the Vancouver Forest Region.

The timber supply initiative identified the need to review existing inventories, and then prepared strategies to reduce constraints, such as methods to reduce the time needed to achieve Visually Effective Green-up, improve visually effective design and visually effective silviculture systems, and rehabilitate poorly designed past operations. In some places, inventoried areas were made into scenic areas; others deemed less important were eliminated. Procedures were implemented to reduce obligations in less sensitive areas.

The broadening of involvement in planning processes and the increasing complexity of visual resource practices and considerations now required skills sets that became increasingly specialized, involving planners and specialists from other fields, including computer geographic information systems (GIS).

Today's VRM practitioners must be visualizers, facilitators, coordinators, and communicators. Any VRM decision can have an enormous influence on timber supplies, costs, revenues, legal obligations, and even international certification of forest products. As practitioners develop their expertise, they need a substantial understanding of visual design, inventory, impact assessment, sociology, GIS, and visual modelling procedures. The skill set and higher level expertise are difficult to achieve, not because of the complexity of the discipline, but because of the general absence of learning opportunities.

Training put on by the Ministry of Forests is available for visual landscape inventory, visual impact assessment, and integrated visual design. Sessions are generally limited to several days in extent. However excellent the courses may be, an individual, after three days of learning, cannot be expected to grasp the full impact of his or her projects on the viability of the working forest and the larger landscape beyond. There are still no core courses or certification requirements for VRM for Registered Professional Foresters (members of the Association of B.C. Professional Foresters [ABCPF]) or in the Forest Management Institute of B.C. (FMIBC), and no college or university degrees in that specialty. There is single course in VRM offered at the University of British Columbia, with a future design course proposed. At the British Columbia Institute of Technology, students in the Advanced Diploma Program in Forestry and Fish and Wildlife receive two days of VRM instruction.

There are three main procedures requiring skill sets and training, covering the six phases of VRM:

1. **Inventory/Analysis:** this involves visual landscape inventory, visual landscape analysis (setting visual quality classes and objectives, VLM Phases 1-3)
2. **Design and Assessment (VIA)** (VLM Phase 4)
3. **Implementation and Monitoring** (VLM Phases 5 and 6)

Inventory/Analysis

A three-day Ministry of Forests/Resource Inventory Committee visual landscape inventory training course is offered, and a 70-page manual is provided. Accreditation, necessary to bid for Ministry of Forests' contracts, is achieved by passing the course. The skill sets include the ability to relate camera (3-D) views to map views, think spatially, select key viewpoints, differentiate landscape components on the map, and organize what can be a very large project with travel needs and weather limitations.

The setting of VQOs is the analysis component based on inventory data. It is the responsibility of planning teams or forest district managers under the Forest Practices Code. Interim (recommended) visual quality classes can be set by forest district planning and recreation staff. The skill set is knowing how to integrate needs of environment, industry, the local community and the broader public (regional to universal).

Design and Assessment

The Visual Landscape Design Training Manual (BC Ministry of Forests, 1994) and three-day training course offered by the Ministry of Forests provides a good basis for understanding design

tools and criteria. The skill set includes sketching, photography, selecting key viewpoints, landscape unit definition, updating visually effective green-up, relating plan view to perspective view, recognizing ecosystem constraints and opportunities, knowing timber types, understanding harvest operational considerations, using GIS, and applying visualization techniques. Proposed land-use alterations are assessed for visual impact as directed by the Visual Impact Assessment Guidebook, a Forest Practices Code of British Columbia Act guidebook, originally released in 1995, with a new version released this year. Public perceptions and subsequent guidelines about visual green-up, clear-cutting, and partial-cut timber harvesting were determined in studies and published as Ministry of Forests' documents in 1994–1996. These documents and a related training course on visual impact assessment are offered by the Ministry.

All skills are not necessarily in one person. Design may require a team approach—foresters, engineers, ecologists, people with multiphase forest development skills. Design skills develop through experience: practice, projects, in-house training, work with consultants, workshops, and special courses. The private sector is providing training, mainly in computer visualization applications. Skills in map assembly and accuracy of registration and measurements can be a part of the training. Companies such as RDI conduct workshops in integrated visual design and visual impact assessment, including computer-aided design.

Implementation and Monitoring

On-ground operations require interpretation of goals and objectives to field layout and harvesting crews. Visual quality is achieved through road construction and rehabilitation, edge treatments, silviculture systems, debris management and compliance with visual green-up requirements. The skill set requires the individual to have an engineering background and knowledge of operational costs.

Conclusions and Recommendations

As design is a critical stage for achieving success in VLM and for improving public support and confidence in forest practices overall, more training is needed. A minimum two-week course would be appropriate. Compare what is available for learning ecosystem-based planning. A more lengthy visual landscape design course should become an accredited course for professional registration (ABCPF) and/or in the FMIBC. At the university level, a full term design course, such as that planned at the University of British Columbia, could heighten the science of VRM, not just skills. The course could examine integration of VRM in broader planning to provide increased timber volumes in the short and long term; strategic use of plan-to-perspective analysis to maximize timber availability while meeting VQOs; and use of better design to increase harvest flows and economics. Many aspects would be worthy subjects of higher level research. Courses and research need funding.

Visual Resource Management must continue to evolve as a meaningful and hugely influential discipline. It can't without qualified practitioners with proven credentials. Discussion should immediately commence amongst government, industry, academia, and practitioners as to how these credentials should be acquired, who will ensure they are being correctly implemented, and what administrative and funding mechanisms will create the educational process and system of accreditation. To do less is proving to be too costly. Consulting firms should be brought in more

frequently to provide design courses sponsored by the Ministry of Forests, or accessed directly by forest companies. Accreditation can be administered by the sponsoring agency or by VRM practitioners themselves by forming a professional organization.

Biodiversity, Beauty and the ""Beast": Are beautiful forests sustainable, are sustainable forests beautiful, and is "small" always ecologically desirable?"

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Abstract

Biological diversity is our planet's inheritance from millions of years of evolution. It is nature's "insurance policy" against change, and a rich legacy which will help future generations of humans adjust to change. We squander this inheritance at our own risk and to the detriment of future generations. Humans have been reducing the earth's biological inheritance for thousands of years, but we now have the knowledge, and hopefully the intelligence, to arrest this historical pattern. The idea has developed in western society that if something looks "nice," it must always be ecologically superior and better for biodiversity than something that is undesirable. There is also the idea, which appeals equally to our sensibilities, that there is a "balance of nature," that nature seeks and needs an equilibrium condition, and that change in this condition is bad. Ecosystem disturbance and change are seen as threats to both the survival of nature and to biodiversity. There is no evidence that such generalities are true, and lots of evidence that they are not. Beauty is in the eye of the beholder. What may be judged to be "beautiful," sustainable and good stewardship by an ecologist or biodiversity expert may be ugly, at least for a period of time, to the average citizen. What may be beautiful to a person in the street may not be sustainable of the very ecological and social values that they desire for their children's children. On the other hand, there are many examples in which visual images do provide an accurate assessment of ecological condition and sustainability. The challenge is to identify when our "gut reaction" to visual images provides a reliable basis for making changes in our relationship to resources and the environment, and when it does not. The key message is that we should let knowledge of the ecological and biological diversity of forests, and the associated values we wish to sustain, play a major role in deciding how the many different kinds of forests in the world should be managed. We must not permit dogma, mythology and untested or disproven ideas to prevent us from attaining our biodiversity and sustainability goals. We must not apply any one single forestry policy or management method everywhere, and we must balance the important aesthetic considerations with the ecology of the values we wish to sustain.

... A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise.

... Conservation is paved with good intentions which prove to be futile, or even dangerous, because they are devoid of critical understanding either of the land, or of economic land use.

Aldo Leopold (1953)

Introduction

In common with many other animals, humans are a highly visual species. While we lack the acuity of many species, we depend less on our senses of hearing and smell more on our sight as compared with many other animals. This above-average visual sense may reflect our evolution from tree dwelling primates, but whatever the explanation, it results in a vitally important role of visual information in our lives. Our initial stages of mate, car and house selection, and much of our material purchasing activities (e.g., clothes, art, appliances) are based largely on visual stimuli. We also make profound judgements about the condition and desirability of our environment on the basis of visual impressions.

Humans are an emotional species. We seem to make many of the important decisions in life based on our heart rather than our head. The judgement and choices we make are largely the combined result of the sensory information we receive and our emotional responses to this information. One emotion that appears to be common to many people is a general dislike of change in our environment. We become emotionally attached to the environment we grow up with, and regret the loss of the familiar when change occurs.

As a species that is highly visual and dislikes change, many people judge visible environmental change as undesirable and even bad. If the change also looks bad, we tend to judge it even more negatively. The larger, the more dramatic, and the less aesthetic the change in the environment, the more people tend to assume that the environment has been damaged. Change over small spatial scales which produce modest alterations to the aesthetics are widely assumed to be more "environmentally-friendly" (i.e., good) than spatially and aesthetically larger changes.

Forest environments are always changing under the influence of local ecosystem and landscape processes. Change is initiated by human or non-human-induced disturbance - the former is assumed by many to be bad, while the latter may be considered good or bad. Change continues post-disturbance as a result of ecological processes that act to return the ecosystem to its pre-disturbance condition, or to some final "stable" condition that is then perpetuated (or so the theory goes) until it is again disturbed. This condition is referred to as the ecosystem "climax" condition, and in some types of forest may represent the culmination of ecosystem development.

Perhaps because the ecosystem seems to "want" to return to its climax condition (ecological processes often lead the ecosystem towards it), disturbance that interrupts this development is widely viewed as "bad." This philosophy holds that the "best," the "highest," and the "ethically correct" condition for a forest ecosystem is the mature or climax condition; that young, "juvenile" or immature ecosystems are somehow less desirable and merely an unwelcome stage that has to be passed through as quickly as possible on the way back to the "correct" ecosystem condition: "old growth" or climax.

Another belief system about forests is that "ecosystem integrity," "ecosystem health" and "biodiversity" reach their zenith in very old forests, and that this advanced ecosystem stage is, therefore, biologically richer, more robust and more resilient than younger stages.

The sum of these notions leads to three key ideas: that 1) disturbance in forest ecosystems, especially human-caused disturbance, is bad; 2) biodiversity is greatest in the least disturbed forests, and 3) we can judge the "goodness" or "badness" of ecosystem conditions based solely on visual information. None of these ideas is supported as generalizations by our current scientific knowledge of how forest ecosystems function. Their implementation as the foundation

for policy and practice in forestry in ecologically diverse landscapes would be as unsuccessful in achieving conservation, sustainability and biodiversity goals as the application of any other single management paradigm or philosophy in such variable environments.

In this paper I will examine the question "Are sustainable forest landscapes always beautiful? Are beautiful forest landscapes always sustainable? Can we evaluate biodiversity and sustainability issues based on visual information alone?" I will start with a brief review of "biodiversity" and "sustainability." I will not attempt to define "beauty" as this is a highly individual, value-based judgement

Biodiversity

Possibly the single most emotive and influential term in the current debate over forest management, "biodiversity" is also one of the most complex and poorly defined. Biodiversity, the diversity of all aspects of life and biological communities, can be measured many different ways:

1. Genetic: the diversity of genotypes within a species in the area of interest.
2. Species: the number of species in the area of interest (species richness), and the relative abundance (e.g., common, average, or rare) of the different species in the area (species evenness).
3. Taxonomic: the number of genera, families and higher taxa.
4. Structural: the diversity in the vertical structure (e.g., the number of different canopy layers (trees of different heights) and understory layers (e.g., shrubs, herbs, mosses)) of the plant community, and the horizontal diversity (the spatial patchiness) in structure. The diversity of plants and animals of different life forms (e.g., trees, shrubsherbs, mosses, evergreen deciduous plants; herbivores, carnivores and detritivore animals).
5. Functional: the diversity of different functional groups (ecological guilds) in the area (e.g., shade-tolerant or shade-intolerant plants; fast growing and slow growing plants; plants that are nutrient-demanding or tolerant of low nutrient availability; seed feeding or leaf feeding herbivores; fungal feeding or bacterial feeding soil animals.)
6. Temporal: the degrees of change over time in all the other measures.

These measures can be assessed over small areas (stands: 1- 100 ha) - alpha diversity; local landscapes (100- 10 000 ha) - beta diversity; and regional landscapes (perhaps > 10 000 ha depending on the area concerned) - gamma diversity. Alpha diversity is the variation in measures 1 to 5 in local stands. Beta diversity is the variation in these measures between local stands that vary in soil characteristics and disturbance history; it usually refers to diversity within a single climatic area. Gamma diversity is the variation in both alpha and beta diversity measures 1 to 5 over areas large enough to include more than one climatic area and, consequently, more than one ecological zone.

Temporal diversity tends to be high at the alpha spatial scale (because of disturbance and successional recovery), moderate to high at the beta scale (again, because of disturbance and recovery, but it may also be a fairly constant shifting mosaic of ecosystem conditions), and moderate to insignificant at the gamma scale (generally a shifting mosaic of rather constant overall character). The actual level of temporal diversity will depend on the severity, frequency and spatial extent and pattern of disturbance ("natural" or human-caused, both of which should be considered as natural). Temporal diversity at the beta scale is greatest when there is the widest range of age classes of stands in the forest.

Considering the diversity of measures of biodiversity, and the almost ubiquitous occurrence of ecosystem disturbance and the associated temporal diversity, admonitions to "protect biodiversity" and "conserve biodiversity" are, at best, ambiguous, and at worst, unattainable. Maintaining any one of the alpha measures 1 to 5 without change may prevent natural temporal diversity. But, in many forest ecosystems, maintenance of ecosystem function and species diversity requires the temporal diversity that results from disturbance and the processes of ecosystem development. For example, in many Canadian forests, deciduous hardwood tree species, which are so important for the long term maintenance of soil fertility, site productivity, wildlife habitat and various measures of alpha diversity, require periodic ecosystem disturbance because they are disturbance dependent, early seral, shade-intolerant plants. Variation over time in most alpha and many beta measures of biological diversity are necessary for the long term maintenance of these and other diversity measures. However, maintaining temporal diversity will result in changes in measures 1 to 5. Policies designed to "conserve" biodiversity must, therefore, be based on explicit and specific goals with respect to the various measures of diversity at the three spatial scales, and must sustain historical patterns of temporal diversity if historical ranges in other biodiversity measures are to be sustained at any of these spatial scales.

Sustainability

If we were to accept that in the absence of human activity forest ecosystems are stable, equilibrium systems, the definition of sustainability would be easy. It would be the absence of significant change. Sustainable forest management would involve only those activities that result in minimum ecosystem disturbance and change, and which maintain the ecosystem in a climax or old growth-like condition. Most measures of biodiversity would remain relatively constant, and temporal diversity would be minimized. However, that is not the natural ecological character of most forests, and this invalidates the idea of constancy as the basis for the definition of sustainability.

Given the well-documented role of periodic disturbance in sustaining ecosystem function and diversity, sustainability must be defined as a *non-declining pattern of change*. Such a pattern, and thus sustainability, cannot be described or defined in terms of any one of: 1) the degree and spatial scale of disturbance (e.g., pictures of recently clearcut areas); 2) the frequency of disturbance (e.g., the rotation length or frequency of harvest in even-age forest management, the frequency of partial harvesting in uneven age forest, or the frequency of fire, insect epidemics or landslides); or 3) the resilience of the ecosystem (the rate of the ecological processes that return the ecosystem towards its pre-disturbance condition). It is the combination of these three variables that defines non-declining patterns of change. This combination is captured in the concept of "ecological rotations" - *the time taken for an ecosystem of a particular resilience to recover from a particular disturbance back to pre-disturbance condition, or to some desired new condition*.

Ecological rotations in a particular ecosystem can range from short in the case of partial timber harvests or low intensity "natural" disturbance, to medium or long in the case of clearcutting, landslides, or stand replacing fire, insect, wind or disease events. The specific combination of disturbance severity and disturbance frequency chosen to produce an ecological rotation in forest management will depend upon the degree of ecosystem disturbance required to achieve specific biodiversity, ecosystem structure and ecosystem function goals. Where these goals require less disturbance, the frequency can be higher (shorter rotations) and vice versa. Where

management objectives call for frequent entry partial harvesting, disturbance at each harvest entry must be limited, but this may not provide the level of disturbance required by the ecology of certain desired species. The disturbance required to sustain these species may require infrequent harvest entries.

The desired frequency of timber harvests is generally influenced by economic, social and other non-ecological/environmental consideration. However, if the forester wishes to define frequency of disturbance in this way, his/her choice of severity and scale of disturbance must be constrained to that defined by the ecological rotation, if sustainability is a goal. Similarly, if foresters wish to apply a particular severity and scale of disturbance for silvicultural, wildlife habitat or other reasons, then their choice of frequency of disturbance will be constrained.

Recent applications of the concept of ecological rotations can be seen in the concept of "variable retention logging" (VRL). In this system, the degree of ecosystem change caused by timber harvesting is moderated by the retention of patches of snags, younger trees and/or mature trees within a cut block. This is done to sustain mature forest structural attributes in a stand that is being logged at a frequency that is too short for these structural features to be renewed by processes occurring within the rotation period. VRL allows for the maintenance of ecological features of both younger and older ecosystem stages within a single stand, and a balance of economic and environmental objectives on the same area. It is a way of achieving an ecological rotation in a reduced period of time, but care must be taken, by the use of ecosystem management simulation models, that other aspects of sustainability are addressed in a system that is focused on stand structural attributes.

Beauty and the Beast

Ecosystem disturbance is both natural and, in many forests, necessary to sustain historical ranges of ecosystem productivity and biological diversity. Depending on the aesthetic preferences of the observer, the immediate results are not always beautiful. Wildfire, landslides, insects, diseases, wind and logging can all diminish the aesthetic values of a stand or a landscape for periods varying from years to many decades. However, unless the disturbance frequency is substantially shorter than the ecological rotation, aesthetic qualities are restored as the forest regrows and the ecosystem returns towards pre-disturbance conditions. Like the "ugly duckling," or the allegorical story of "Beauty and the Beast," initial ugliness may hide, or give way to, beauty. Conversely, beauty may be "skin deep"; superficial "beauty" may hide, or give way to, something less desirable.

Many types of forest harvesting diminish the aesthetic quality of a stand or a landscape for a while, only to give way in time to a visually attractive younger forest or a new and different landscape mosaic. Accompanying the aesthetic changes will be changes in various measures of biological diversity and ecosystem productivity. In some cases, these measures will be increased by disturbance even though the aesthetic quality has declined. In other cases, declines in aesthetic values will be accompanied by declines in certain functional and diversity values. As the aesthetic quality recovers, there will be changes in functional and diversity characteristics, but there will not be any simple, predictable relationships between the visual recovery and the changes in these characteristics.

Perhaps the classic case of the aesthetic "beast" turning into beauty is clearcutting. Arguably the most aesthetically displeasing and most publicly disliked of the silvicultural systems, clearcutting can, and frequently does, result in beautiful second growth forests. This is especially

true if natural regeneration, topographic diversity, longer rotations, variable retention logging and stand management activities combine to promote in the younger stands the visually pleasing structures and species diversity normally associated with older stands. In contrast, partial harvesting without adequate disturbance can, in some forest types, promote a forest that is maladapted to the climate, has a high incidence of parasites and diseases, and has reduced levels of some measures of biodiversity. Immediately following harvest the aesthetics of a particular partial harvesting area may be far preferable to that of clearcutting, but after several or many decades the aesthetic status of the two types of logging can reverse.

Aesthetics, Sustainability and Biodiversity

There is little doubt that in the case of the most extreme ecosystem disturbance (e.g., landslides that remove the soil mantle and leave only hard, unweathered rock or compacted subsoil), visual evaluations provide a reliable basis for predicting impacts on ecosystem productivity and measures of biodiversity. Similarly, very extensive and severe wildfires, or very large clearcuts that are subsequently burned but not planted, will recover very slowly because of slow natural processes of regeneration. Again, the visual information can provide an acceptably reliable evaluation. In less extreme cases, useful relationships between visual information and ecosystem sustainability are generally not available. Without understanding ecosystem resilience (which cannot be easily judged by the visual clues available to the average person) and the anticipated frequency of future disturbance, simple post-disturbance visual observations provide no basis for sustainability evaluation.

The visual quality of a forest is an important value for most people. Consequently, foresters should not ignore aesthetics simply because it is not well correlated to ecosystem "health," "integrity," "sustainability," or to measures of biodiversity. Managing a forest to provide recreation and spiritual values and to maintain the visual quality of the environment for people is one of the responsibilities of a forester. However, one must ask, "should foresters threaten the future sustainability and biodiversity of a forest in order to satisfy the aesthetic preferences of the present generation?" Would this be aesthetic self indulgence on our part? Or should we balance our visual preferences against our "intergenerational equity" obligations to pass on to future generations the biological diversity and ecosystem functions we think they will want?

There is no simple answer to this question; it will vary in different countries and societies that have different aesthetic preferences, in different types of ecosystem, and between different geographical locations for any particular type of ecosystem within a particular country. However, in seeking an ethical answer to this question, we must respect nature for what it is, and not what we might wish it to be. We must respect the role of both disturbance and ecosystem processes in defining the ecological characteristics of forests, which in turn determine sustainability, biodiversity and ecosystem "beauty."

The "Beast" in Forestry

The "Beast" in forestry is not reliably related to aesthetic preferences of people. While "ugliness" in ecosystems is sometimes usefully related to ecosystem characteristics, in most cases it is not. This is because "beauty" and "ugliness" are not absolute values; they depend on the preferences of individual observers. It is also because there are few reliable relationships between aesthetic values and measures of environmental condition and function. The "Beast" in the past has

between unregulated exploitation or "administrative forestry" where this has ignored ecological diversity and impaired ecosystem function. It has failed to respect "nature." This "Beast" is steadily being tamed, although it still raises its "ugly" head in some parts of the world. However, there is a new "Beast" to be dealt with. It travels under the guise of "beauty." It is forestry that is designed to satisfy our visual preferences but which ignores the ecology of sustainability and diversity - forestry that denies the ecological role of frequencies, severities and scales of disturbance that are in balance with ecosystem resiliences and are necessary if we are to be successful in passing on desired forest values to future generations.

I am not referring here to intensively managed, even-aged, monoculture plantations managed on short rotations. These wood fibre production systems are a vital part of human activity supplying both desirable and necessary wood products and certain non-wood forest products, values and services to society. Such plantations, when managed sustainably, help take the pressure off unmanaged native forests and are a vital component of any conservation strategy. However, they often lack the aesthetic qualities of a more "natural" forest, although in some cases (e.g., fire-origin boreal pine forests), such plantations closely approximate "natural" stands, and, therefore, do have "natural" aesthetic qualities. My comments refer more to the management of native forests, especially those that are being put under management for the first time.

The emerging "Beast" in forestry is thus the mirror image of the earlier "Beast" which ignored ecological diversity and ecosystem function, and frequently applied excessive combinations of disturbance severity, scale, and frequency that were inconsistent with the maintenance of desired values. The new "Beast" is making exactly the same mistake, but at the other extreme of the disturbance spectrum: too little disturbance rather than too much, which was often the problem in the past. Both "Beasts" must be tamed and replaced by a respect for ecological diversity and the variable role of disturbance in different forest ecosystems. Variable retention logging to represent a spectrum of severities of disturbance (which approximates the application of the full range of silvicultural systems, modified to sustain a wider range of values than was the case in the past), variable rotation lengths, and variation in the size of disturbance patches are necessary to ensure that forests are managed under ecological rotations to maintain non-declining patterns of change in stand conditions, and a non-declining shifting mosaic of disturbance patches of different sizes and ecological conditions across the landscape.

Developing a Land Ethic: Respect for Nature

With the world population reaching six billion in the summer of 1999 (a six-times increase since 1800, and a doubling since 1960), with a possible future population growth to somewhere between nine billion and 15 billion over the next century or two, and with about 40% of the world's forest cover having been reported as lost, there is a critical need to develop a more sustainable relationship between humans and the other species with which we share the planet.

In developing this theme in his essay *The Land Ethic*, Aldo Leopold stressed the importance of sustaining the "integrity" and "stability" of the biotic community. His writing, including *The Sand County Almanac*, has provided the philosophical foundation for much of the modern conservation and environmental movements. Leopold's concerns, including the often-quoted phrase "the first rule of intelligent tinkering is to keep all the parts," clearly refers to the landscape rather than the stand level. After all, nature is continually replacing many of the parts at the stand level (alpha temporal diversity). Implicitly, his reference to the biotic community was intended to embrace the concept of ecosystem, in which change is part of integrity and

stability. Unfortunately, in the first quotation from *The Land Ethic* at the start of this paper, he links the "beauty of the biotic community" to the "integrity and stability" of that community. This has been misinterpreted by many to imply that change and "ugliness" in the biotic community are inconsistent with "integrity and stability." This does not appear to be what Leopold intended, and the second quotation from *The Land Ethic* clearly shows his concern that the common misunderstanding of these issues can render well-intentioned conservation efforts ineffective or even counter-productive. While the first of these quotations appears commonly in the conservation and environmental debate, the second rarely does. This has contributed to the misunderstanding of the relationship between visual and aesthetic evaluations of ecosystems and their ecological condition. It has contributed to the aesthetic evaluation of the environment rather than an analytical, ecological analysis. The foundation for a land ethic must be respect for nature. There are two broad meanings of the term respect:

- to esteem, revere, honour, to treat with deference;
- to notice with attention, to take due account of.

The first of these sets of meanings implies a qualitative, spiritual and value-based approach to the object of respect. It is closely linked to the ideas of equilibrium, and lack of disturbance and change. It is often associated with aesthetics and visual evaluation. This aspect of respect plays an important role in establishing the values and ecosystem condition and services we want sustained in our forests. It relates to the setting of land use policy and objectives of management, in which aesthetic values play an important role

The second set of meanings implies a quantitative, analytical and scientific approach to respect. It is linked to careful observations of ecological and biological diversity, of ecosystem structures and processes and of the role of disturbance and ecosystem recovery as "natural" processes involved in, and necessary for, sustaining a variety of desired forest values and conditions. This interpretation of respect is the necessary foundation for the design of forest management strategies and practices that will ensure that we respect nature in the sense of the first definition

Respect for nature defined in this way is clearly consistent with Leopold's writing. His ideas do not, as is sometimes inferred, relate only to the first definition of respect; they apply to both.

Conclusions

We owe it to our great grandchildren to pass to them a world in better condition than was inherited by our generation. At the same time we have to satisfy the needs and, where possible, the desires of the present generation. As a society we must learn to act more ethically: to do the right thing.

Unfortunately ethical behaviour in forestry cannot simply be defined in terms of present conditions. "Doing the right thing" involves a consideration of short, medium and long term consequences of our actions. This means that both the short term aesthetic qualities and the long-term ecological consequences of management decisions should be considered. Because of the lack of consistent relationships between visual qualities and the ecology of forest stands and landscapes, short-term visual characteristics cannot be the basis for forecasting the medium and long-term consequences, despite their importance as a short-term forest value. "Beautiful" stands and landscapes are not necessarily sustainable. Sustainable stands and landscapes are not always "beautiful" all the time. Small-scale disturbance is not always what is needed to maintain desired levels of biodiversity and future ecosystem productivity.

Sustainable forest management must be founded on a respect for nature as it is, not as we might want it to be. Respect for nature requires a clear separation between "beauty" and the sustainability of the diversity of values we wish to leave as a legacy for the future.

Suggested Readings

- Attiwill, P.M. 1994a. Ecological disturbance and the conservative management of eucalypt forests in Australia. *For. Ecol. Manage.* 63:303-368.
- Attiwill, P.M. 1994b. The disturbance of forest ecosystems: the ecological basis for conservation management. *For. Ecol. Manage.* 63: 247-300.
- Botkin, D.B. 1990. *Discordant Harmonies. A New Ecology for the 21st Century.* Oxford Univ. Press. NY.
- Kimmins, J.P. 1996. The health and integrity of forest ecosystems: are they threatened by forestry? *Ecosystem Health* 2: 5-18.
- Kimmins, J.P. 1996. Importance of soil and the role of ecosystem disturbance for sustained productivity of cool temperate and boreal forests. *Soil Sci. Soc. Amer. J.* 60: 1643-1654.
- Kimmins, J.P. 1997a. Biodiversity and its relationship to ecosystem health and integrity. *For. Chron.* 73: 229-232.
- Kimmins, J.P. 1997b. *Balancing Act: Environmental Issues in Forestry.* UBC Press, Vancouver.
- Kimmins, J.P. 1999a. Respect for Nature. *Proc. Symp. Ecosystem Management of Forested Landscapes: Directions and Implementation.* 26-28 October 1998. Nelson, BC. In press.
- Kimmins, J.P. 1999b. Visible and non-visible indicators of forest sustainability. Beauty, beholders and belief systems. *Proc. Peter Wall Conference. Linking Sustainability to Aesthetics - Do People Prefer Sustainable Landscapes?* Fac. Forestry, Univ. of BC. In press.
- Leopold, A. 1953. *The Land Ethic.* In *Round River.* Oxford Univ. Press. Oxford.
- Salim, E. and O. Ullsten. 1999. *Our Forests, Our Future.* Report of the World Commission on Forests and Sustainable Development. Cambridge Univ. Press, Cambridge, U

Using Landscape Architecture and Silviculture Techniques in the Roadside Landscape

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The Visual Landscape, the Ecological Landscape, and Wildland Aesthetics

In our usual discussions about the landscape, we are probably talking about the landscape that we can see. But the visual landscape is at the same time a complex composition created by natural processes, so it is also an ecological landscape. These two aspects joined into a single image also bring us into a position to appreciate the landscape for its aesthetic values.

Yi-Fu Tuan, geographer (1974), observes that aesthetic appreciation of the landscape is enhanced and extended (indeed made possible) by scientific curiosity and by the recognition that some human artifact or event may have been associated with place. Although not the subject of this paper, the historic and cultural landscape is another dimension of aesthetics. All this gives emphasis to the point that knowledge is an essential ingredient of aesthetics. It is notable that aestheticians of the past have not dealt with aesthetics of nature. Rather, ecologists, geologists, naturalists and others based in the natural sciences have been the champions of landscape aesthetics. Leopold, King, Muir and Dasmann are some of those who have written about appreciation of the natural world and processes involved. It should also be recognized that some contemporary philosophers are saying that the landscape—the environment—is a worthy subject of aesthetic appreciation (Carlson, 1995).

Seeing the landscape as merely visual is selling it short. It is certainly the visual resource that landscape architects and others of the design professions may describe using perceptual, design and formalistic descriptors, such as "form," "space," "color" and so on. It is simultaneously the ecological resource described by ecologists and silviculturalists as a landscape created by natural processes—the product of biotic, physiographic and climatic influences working together over time.

The visual and ecological landscapes brought together form the composition that can also be called the aesthetic resource. The duality of landscape aesthetics does not lend itself to simple definition. And it is somewhat foolhardy to try. But a crude, working definition is offered here: An aesthetic experience with the landscape may be called a pleasurable response, a satisfying reaction, upon seeing and appreciating certain sensuous and formalistic qualities in the landscape, combined with a foundation of knowledge and understanding of the landscape's creation.

The landscape aesthetics I speak of in this paper relate to wildlands, that big spread of country that is dominated by what is of, or seems to be in, a native or natural state. These may show signs of human use and occupation, but they are unquestionably non-urban. They might include areas designated as scenic or of some other special merit, but no such restrictions are implied. In

British Columbia, lands administered by the Ministry of Forests, and in the U.S., the lands within the jurisdiction of the Forest Service, clearly represent these wildlands. They make up the landscape continuum that includes the ordinary everyday landscape, the extraordinary and the monotonous, some showing signs of abuse or heavy-handed management, yet all worthy of appreciation.

Connections: Landscape Architecture, Silviculture and Ecology

There are a number of basic connections between the fields of landscape architecture, silviculture and ecology so that they have certain commonalities or philosophical relationships that aid their combined use. Within the bounds of my experience, the contemporary silviculturalist has a broad base in ecology. Despite the various specializations an ecologist may adopt, I take the privilege of interchanging title of ecology and silviculture. Present-day silviculturalists are using their skills for more purposes than saw log production. Their various applications may include the repair of lands left derelict, support for recreation purposes, forest landscape restoration or reintroduction of endemic species rather than use of exotic species. (Parenthetically, I will also add that *ecology* and *environment* were not buzz words when I was a university student some six decades ago.)

There are several basic tenets about the quality and characteristics of the landscape that both the landscape architect and ecologist share.

Unity is the first tenet and it is used by the landscape architect to mean that all parts of a composition appear to fit together, belong together, or are otherwise integrated so there is the sense of a single whole—a composition with unity. The ecologist prefers the term “stability” that has a meaning similar to unity. This sense of a single whole is applied to both the limited landscape, seen from a single station point, and to the continuity of the larger landscape that can only be perceived over time and with travel. This larger, regional landscape would be familiar to us under various names as a geologic, geomorphic, physiographic or landscape province.

Stability (or integrity) is the term used by the ecologist/silviculturalist to recognize that the biotic parts of the landscape interact with their environment to produce a unified whole—a principle like aesthetic unity. This stability is dynamic, representing a history of change. Ecological linkages between biota (flora and fauna) and their physiographic-climatic foundation provide stability in a visual sense so long as the foundation remains intact.

Variety is the design term and principle used by the landscape architect to recognize the richness or degree of richness in the number of diverse parts of the landscape. The ecologist uses *diversity* (see below) in a similar way as he or she uses variety. This is a mosaic subordinate to unity. The presence of more and diverse parts implies greater visual interest and higher quality in the comparison of various landscapes. Pepper (1937) observes that variety in art is in tension with unity—and so it is the same with the landscape. Variety has the potential of being chaotic were it not for nature and its processes that provide the organizational simplifications of repetition, segregation and visual contrast.

Diversity (or complexity) as used by the ecologist refers to the network of interrelating components in a particular place and over time in a way that is necessary for ecological stability.

Visually it is a richness of parts that may be seen as similar to aesthetic variety. This is a safety net that has the potential of combating destructive phenomena: diseases, extended drought, insects, catastrophic fire and the like. While categorizing diversity primarily for its visual parts, biodiversity also includes an invisible part of the mixture, providing protective functions through its genetic structure.

The visual complexity of any landscape image is described one way by an ecologist and another way by a designer-landscape architect. The richness of variety or diversity and the compositional entity of unity and stability are descriptive means by which two different disciplines seek to judge the quality of the combined visual and ecological landscape. Appreciation of these two approaches gives us an aesthetic dimension.

Vividness is an evaluative work in aesthetics and pursued by landscape architects, but it has no equivalent in the language of ecology. It has several other substitute words: "intensity" and "novelty" (Beardsley, 1958; Pepper, 1937). All of these indicate the observer enjoys an aesthetic response that is immediate, striking the memorable. No doubt those of us who have had the advantage of working in the great-out-of-doors have enjoyed vivid and memorable events revealed to us in the landscape. Some ecologists have written about times, places and circumstances that have left life-long memories so vivid they seem of yesterday's creation (Leopold, 1949, pp. 125-128). Raymond Dasmann (1968), wildlife ecologist, speaks with authority and enthusiasm of the qualitative values of diversity, whether they're encountered in wildlands or in our urban surroundings. He stresses the need for variety, as it provides means for bettering our human condition.

Both the landscape architect and the ecologist/silviculturalist have another direct connection in their mutual need to observe and study the landscape *in the field*. This is at the level of application after references and reports have been read, maps and photographs examined, conferences held, objectives identified, and a task undertaken.

I am a great believer in field work and observation. As a professor of landscape architecture and environmental planning for more years than I may care to admit, I have emphasized the need for field study and have demanded the capability of field (and other) sketching and drawing that is essential for any landscape architect. Beyond professional needs, I also sketch for pleasure in studying any landscape wherever I may be. It's a habit.

When the ecologists/silviculturalists and I are in the field together, we make sure we both see the same things we look at. We make notes and I will sketch. Photographs are made. As various manipulations are considered, "what if" questions arise. A rough sketch can address the question of what might this place look like if we try "this." If we decide "this" is a miserable idea for either visual or ecological reasons, we try something else. These things can be done quickly, something a designer may call "quick and dirty"—a rough study idea worth pursuing or rejecting. Step by step, you arrive at some satisfactory working decision.

Combining Silviculture and Landscape Architecture in an Experimental Project

In 1976, colleague Philip McDonald and I started a roadside landscape management experiment in the Plumas National Forest in Northern California. The project was completed in 1980. We were both with the Pacific Southwest Experiment Station of the U.S. Forest Service: he was a research forester/silviculturalist and I was a research landscape architect. Roadside forestry—management and harvesting—has usually been avoided in National Forests because public opinion is prone to be highly critical of the idea and the procedures involved. In cooperation with the Plumas National Forest supervisor and staff, we developed a study plan for a landscape management project. The basic objective was that of altering a road with a very monotonous green forest corridor to provide a more interesting, varied and pleasing landscape for passing travellers. Numerous other functional and design objectives were vested in the study, including the following:

1. To develop an altered roadside landscape, maintaining the unity of the forest from beginning to end.
2. The experiment to be guided by the forest components species present and stand conditions.
3. To create a landscape with improved visual display of its different vegetation components for aesthetic and educational purposes.
4. To use vegetation manipulation so that the forest road has more directed sight lines for purposes of aesthetics and safety (e.g., by leaving a dense stand dead ahead countered with an adjacent open diagonal view).
5. To leave a more open forest environment that would sustain good or improved growth as well as providing visual interest.
6. To create a forest landscape altered through traditional silvicultural methods, including timber cutting, thinning, and brush cutting. Some dense clumps or stands were left "as-is."
7. To create a roadside zone with changes made for improved fire protection.
8. To finance the roadside landscape experiment through timber harvest proceeds.
9. To monitor the study area's visual and ecological response for a period of years after the project's completion.

The project site in Plumas National Forest is a three-mile segment along California State Highway ELL, with a roadside zone of 176 acres (80 ha). It is at latitude 39° north, 11° south of Kamloops, B.C. It is a high-quality site with deep, well-drained soil. It sits at an elevation of 4700–4900 feet (1425–1480 m), with a Mediterranean climate, typical of California. Average annual precipitation is 80 inches and often more; average temperature is about 50° F, with some 150 frost-free days per year.

The forest cover is of the Sierra Nevada mixed conifer type. Dominant overstory species, in order of decreasing abundance, are California white fir (*Abies concolor* var. *loweana*), sugar pine (*Pinus lambertiana*), insense-cedar (*Libocedrus decurrens*, now *Calocedrus* sp.), coast Douglas-fir (*Pseudotsuga menziesii*), and California black oak (*Quercus kelloggii*). Significant understory broad-leaf species are Pacific dogwood (*Cornus nuttallii*), shrub tanbark (*Lithocarpus densiflorus* var.), golden chinquapin (*Castanopsis chrysophylla* var.), California hazel (*Corylus cornuta*

var. californica), and Sierra coffeeberry (*Rhamnus rubra*), along with numerous other herbaceous species.

The project is laid out in 10 visual compartments, or units, defined by the sign lines bounded within the combination of tangents and curves, both horizontal and vertical, of the existing road. Units are of 0.1- to 0.6-mile lengths, with areas from 5 to 35 acres. A physical plan shows the visual units with schematic representation of existing conditions and prescriptive manipulations. This is a normal landscape architectural technique. It is also a control meant to ensure the continuity or unity of the forest character throughout the extent of the project.

At a prudent speed of 35 mph, the area can be seen in five minutes. Within an elevational range of only 200 feet (60 m) and no potential for long views beyond the roadside, all spatial alterations are within a foreground distance with views no more than $\frac{1}{4}$ to $\frac{1}{2}$ mile lengths. As a consequence, the landscape alterations are subtle. They are more apparent with the seasonal response of hardwoods in spring and fall coloration and when advantageous lighting shows improved visual penetration into the forest. Contrasts between dense stands and more open manipulated areas are also visually enhanced with certain caprices of light and shade.

All landscapes, no matter whether grand or ordinary, have times when they present vivid and memorable images. I have referred to temporary conditions as creating ephemeral landscapes. They may exist for minutes, hours, days, weeks, or seasons. All are results of natural phenomena: light and shade, shadows and reflections, meteorological, climatic and atmospheric changes, seasonal alterations, animal presence, and signs, the last including such things as animal tracks, fallen leaves, snake skins, last season's flower stalks, bird feathers and so on. Signs are the remnants left behind, suggesting next year's promise. They remind us that the landscape is alive (Litton, 1972). The Plumas Forest will provide some of these fleeting events if you are there at the right time. Some are surprises, some can be sought if they are seasonal or accompany some natural cycle.

For the study area and this presentation, photographic records give some before-and-after evidence of change during the 1976–1980 period when the silvicultural procedures were applied and completed. The growth changes observed between 1980 and 1986 are modest ones, but they are apparent. The vividness of ephemeral events is lacking.

To complete this review of the Plumas Forest experiment, see the abbreviated summary taken from research paper PSW-RP-235, USDA, Forest Service. It is an appendix item with the reference list for this paper.

My thanks to Jacques Marc and his colleagues for inviting me to participate in this conference, Beyond the Trees/ Visual Stewardship.

References

- Beardsley, Monroe C. 1958. *Aesthetics: Problems in the Philosophy of Criticism*. New York: Harcourt Brace and Company.
- Carlson, A. 1995. "Nature, Aesthetic Appreciation and Knowledge." *Journal of Aesthetics and Art Criticism*. 53: 393–400.
- Dasmann, Raymond F. 1968. *A Different Kind of Country*. New York: MacMillan.
- Leopold, Aldo. 1949. *A Sand Country Almanac*. Oxford University Press.
- Litton, R. Burton, Jr. 1972. "Aesthetic Dimensions of the Landscape," pp. 262–291, in *Natural Environments*, John Y. Krutilla (ed.) Baltimore, MD: Johns Hopkins Press. For Resources for the Future, Inc.
- McDonald, P.M. and Litton, R. Burton, Jr. 1998. *Combining Silviculture and Landscape Architecture to Enhance the Roadside View*. Research Paper PSW-RP-235. Albany, CA: Pacific SW Research Station, Forest Service, USDA.
- Pepper, Stephen C. 1937. *Aesthetic Quality: A Contextualistic Theory of Beauty*. New York: Charles Scribner's Sons.
- Tuan, Yi-Fu. 1974. *Topophilia*. Englewood Cliffs, NJ: Prentice

Aesthetics Considerations in British Forestry

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Aesthetics Considerations in British Forestry

- What is Landscape?
- Past Influences
- Making it Look Natural
- Setting Out the Net – Design Principles
- Filling in the Holes – Forest Stands
- Accurate Delivery – The Funnel
- Bringing it Home
- What Now?

What is Landscape?

The OED defines “landscape” as a prospect of scenery; the word derives from a Dutch word originally used in relation to painting in the 17th century. Since then it has come to mean everything that we see out of doors in three dimensions (and possibly four).

The landscape is a resource for tourism and spiritual renewal. The most popular activity in the countryside is looking at the landscape. The landscape can add to the value of our estate, with attractive-looking woodlands selling for more than the unattractive sites in some areas.

It inspires most of us here to do what we do. But at a deeper level it releases in us the stimulation to fulfill our fundamental drives for food and shelter, as shown by Appleton’s prospect and refuge theory. It can be the source of profound peace or strong anxiety.

The public knows that words are cheap, and that as an industry is the most emotive and direct indicator of our commitment to environmental care. Will we be believed if we say that we are environmentally concerned and at the same time our landscapes look alien and brutal?

Every mark that we make on the ground has a meaning and is a demonstration of an attitude of mind. It is the totality of those marks in the forest landscape that adds up to a demonstration of our care for the environment and our respect for people

Past Influences

The consciousness of the value of the natural landscape in Britain started with William Kent in the 18th century, but it was in the 19th century that the social reforms of paid holidays and the

growth of the railways made the countryside available to the urban masses seeking relief from the harshness of the industrial environment.

The landscape that they experienced was by then largely deforested. As a result, with the exceptions of one or two significant forest destinations such as the New Forest and the Forest of Dean, our population developed a great affection for the open hills and the numerous pastoral enclosures of the lowlands.

Today, 93% of our people live in towns and have a sense of the British landscape as a place far more for visual enjoyment and recreation than for economic activity or as a source of food.

Forestry as a profession hardly featured historically or culturally in the same way that it did in France or Germany. Our literature has far more to say about farmers and keepers. The long-surviving forests were seen for centuries as places for royal hunts rather than for the production of timber.

With hindsight, it was therefore hardly surprising that soon after extensive plantings of exotic conifers—with their rapid-growth vertical profile and dense shade—there began to be serious opposition to the forest industry. The new forests (with a very few notable exceptions) imposed square geometry on the beloved landscapes of Britain at an unprecedented scale, screening out the subtleties of natural vegetation and detail of rock, water and scree.

Making It Look Natural – The Visual Approach

- Do not try to hide it – make it look good
- Make it look as natural as possible
- Make it varied
- Start with what is there
- Bring back the space (including clearcut)

Whenever man puts his hand unthinkingly on the land, its appearance tends to become more geometric, more regular, more uniform and less vegetated. The design philosophy developed by Sylvia Crowe was intended to counteract this tendency in order to maintain a diverse range of more natural landscapes for the nation. What has resulted is an approach to forest design that has the following qualities:

- site based, in that the design is derived from what is present;
- pragmatic, in that the design is derived from practice;
- flexible, in that the design is responsive to a variety of landscapes, management practices and objectives;
- perceptual, in that the design arises from, and delivers, what is seen;
- creative in response to landscape change, rather than disguising;
- formal, in that the design is concerned with the form of the landscape and the disposition of landscape elements in space;
- professionally derived and probably somewhat paternalistic;
- qualitative rather than quantitative;

- more objective than subjective; and
- naturalistic rather than humanistic in appearance.

Setting Out the Net

Design Principles for relating patches, corridors, and matrix to the landscape

- Shape
- Visual Force
- Scale
- Diversity



By *shape* we mean the relationship of the edges of an area or object. Shape is the most important principle because it affects our perception most strongly and can easily override our other perceptions. We tend to associate shapes most strongly with our previous experience and memories, and we tend to organise and classify shapes that may have any geometric associations, particularly with the square, triangle and circle.

Geometric shapes are highly artificial and, if we are to create natural shapes, we must break strongly from any geometric characteristics. Geometric shapes are characterised by straight lines, right angles, compactness and symmetry; natural shapes are characterised by curved lines, diagonal emphasis, irregular angles, diffuseness and asymmetry. We associate strongly anything with the human form, and any vertical feature running at right angles to the contour or any bilateral symmetry tends to appear out of place. The natural tendency to design parallelism and symmetry needs to be eliminated.

The concept of “visual force” is based on the idea that an image can generate a dynamic response in the viewer. Some of the most powerful are optical illusions such as those used in op art. Similarly, one part of an image can appear to act upon another in such a way that a relationship is established between the two and the attention is drawn in a predictable way.

It is also the case in landscapes, although frequently more subtle. For example, a crag may appear to push rows of trees. Or the sides of a lake may appear to be moving together, with the eye being drawn inwards from one ridge to another. Similarly, we find ourselves responding to landform, with the eye being drawn downwards on ridges along the line of the road and rising gently in concave ground.

Such analysis has become widespread and it provides a direct way of relating forest shape to the three dimensions of the landscape and overcoming the problem of changing appearance from different viewpoints. Similar effects occur in natural and semi-natural vegetation in the Lake District and in the west of Scotland, with Atlantic oak woods running from the low shore up narrow glens.

Scale is concerned with the size of elements in the landscape, both in relation to each other and to us. The scale of the landscape can be defined accordingly by how much of it we can see in three dimensions: how far and how wide is the view, or how much of a vertical difference in altitude can be seen.

In medium-scale landscapes, the volume of the space becomes more apparent; and, as the scale is reduced further, so the importance of detail increases.

The consequence of all this is that the scale changes with viewpoint and position in the landscape. We must design of the size and shape of changes on more distant views of the landscape at the large scale. However, in smaller contained views the design of elements and their space is very important.

There is also interaction of shape and scale in that what may appear irregular in the short view looks geometric in the long view.

The relative *size* of different elements of the view is also important. The scale of one element, such as a large felling coupe may often leave unsightly small remnants on the ridge top. By contrast, a small felling coupe occupying just under one-third of the landscape composition in this view looks far more appropriate.

We use the term *diversity* not in the same sense of structural or species diversity as an ecologist would, but in terms of the number and difference of visual elements in a view. The quality of views in Britain often lies in their diversity, with forest and open space, water, buildings, conifers and broadleaf trees, enclosed pasture and open mountain all featuring in the best examples—often composed by the domination of man's efforts by natural landform, soils and climate. Incorporating diversity into forest planning involves both (a) taking an inventory of the landscape resource and (b) planning and managing forest stands. The inventory should include the identification of: existing and potential view points; open spaces within the forest, such as agricultural clearings; opportunities for recreation, trails, etc.; both moving and still water; rock crag and scree features; and important ground vegetation, whether rare or common, such as the heather, bilberry and birch typical of the uplands fauna and the breeding territories of rare species such as the capercaillie which needs open space or the goshawk which uses conifers for nesting. Archaeological sites are very numerous in Britain and their associated landscape contexts need appropriate design. The appearance of historic landscapes such as that at the battlefield of Cullodden is a real challenge, as they will have already changed since the great event.

Variation on our forest stands is also used to enhance visual diversity of our forests. Examples of how we do this is by conserving a small proportion of stands to reach a greater size and age and by using phased clearcuts to increase edge and create greater textural variation of trees of different ages. We also diversify our species by planting a contrast (e.g., larch) to our mainly evergreen productive species to reflect subtleties of landform and native broadleaves along riparian zones.

Unity is one of our key objectives. It involves drawing disparate landscape elements into an overall composition such that they all seem to be part of a greater whole and the whole is greater than the sum of the parts. Interlocking forest shapes and other organising factors such as repeating rhythms, closure and similarity (described in Simon Bell's book, *Elements of Visual Design in the Landscape*), are all important design devices in creating landscape unity. The

framing of individual elements creates disunity. Inventory of landscape character is the key to uniting landscape change within each landscape (e.g., using spiky shapes in spiky topography). The strong colours and vertical form of conifers contrast with the muted tones and rolling landforms of our landscape. Thus, more design effort is required to unify our modern forests with their background and the rounded broadleaved crowns that we expect to see.

Genius loci, or the spirit of place, is the sixth and final design principle that we try to follow. It can also be the most difficult to capture in a photograph. A technically sound photograph can completely fail to capture strong *genius loci* and the most mundane place can be given a strong atmosphere by a good photograph. *Genius loci* is more than landscape character; it occurs when the characteristic parts resonate so as to tap our psyche at a far deeper level. It can best be described by example. In Glencoe in Scotland, the weather tends to be poor, with a low cloud ceiling and massive brooding mountains that loom over the enclosed and winding valleys. It is a place that still seems to be angry about the massacre that took place in the 18th century and for which the Campbells are still regarded with suspicion in Scotland. Its forest is predominantly spruce, which for once looks quite appropriate for Britain. It would be a mistake to relieve that atmosphere with the brightness of Japanese larch.

Filling in The Holes

- Restructuring the forest
- Restoring Open habitat
- Restoring ancientwoods
- Continuous cover



The principles were developed in the 1960s and through the detailed practice in the 1970s there was a shift in emphasis from afforestation to felling. I have already described above how managing patches can add to visual diversity within a co-ordinated overall design. Together with corridors for recreation, roads, paths, habitat and blowdown protection, they all need to be woven into the "holes in the net".

"Filling in the Holes" refers to the variety of vegetation types that have been the focus of attention since the Rio summit. As a result of biodiversity action planning, our landscape design approach has also responded to the need for habitat restoration, most notably of the native Caledonian pine forest in Scotland and of the lowland heath in southern England. The survey work prior to the restoration of ancient woodland from plantations is in progress.

However, it has not always been clear whether such work was conducted as an alternative to landscape design or was subject to visual considerations at all. My own view is that the historic and aesthetic aspects of such work are part of the cultural dimension of sustainable forestry described in our national policy objectives. To ignore them may affect certification and misses a significant opportunity to provide our people with the value of woodland resource that they are entitled to.

Continuous cover forestry is advocated under certification, but it is not always clear to what end and how it relates to landscape and recreation outputs. Reduced visual impacts of slash, more

human scale of intervention close to recreation facilities, large trees and a sense of permanence are all *potential* benefits of continuous cover management, but they cannot be assumed. The choice of the wrong silvicultural system or thoughtless application of a system may cause the following threats to the landscape:

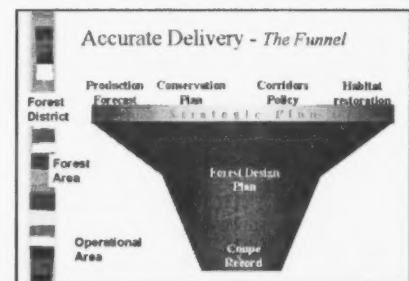
- visual disruption of smooth skylines by small-scale felling;
- a new monotony of groups or single tree selection too widely applied;
- loss of open space experience for visitors; or
- loss of views and screening of landscape features.

We can resolve this by:

- using landscape intervention and protecting views and features;
- developing internal landscape design skills for group systems;
- designing shaped strips to enhance smooth landform and skylines; and
- designing carefully the boundary between clearcut and continuous cover areas.

Accurate Delivery – The Funnel

The forest design plan is the formal application, vehicle for consultation, and key document for the delivery of landscape design. It applies to a forest block or group of forests. More extensive continuous areas of forest may need to be broken into smaller design units, but the design of contiguous stands should still be co-ordinated and not separated across viewsheds. The forest design plan includes landscape inventory, a long-term vision or design concept, phased felling for at least 20 years, and approved felling and replanting for five years.



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Accurate delivery and protection of small features is ensured by the use of the coupe record or operational site assessment, which starts with a site check of each operational area and includes a reference to the forest design plan and any relevant single-purpose plans at the forest district level. The treatment of features which need physical protection or can be managed by means of policy instruments rather than a geographic plan by this means prevent the forest design plan becoming too cumbersome and allow rolling revision of the range of plans used in the forest district. It also means that attention is refocused on vulnerable site detail when it is needed—that is, in planning operations.

We are wary of large and detailed plans, which are often out of date by the time they are approved and often so difficult to refer to that they sit on a shelf and aren't read and seem too big

to start revising. Instead, we have a number of single-purpose plans and policies at the district level which are brought together in a strategic plan that gives relative emphasis to different objectives but no specific outputs. This feeds into forest design plans and the operational site assessment coupe record which in turn draws from site detail and the forest design plan in deciding and specifying action.

Bringing It Home

In 1989, the Forest Landscape Design Guidelines were published and subsequently revised in 1992. These are essentially a distillation of the design principles into industry best practice. The guidelines were further endorsed by the publication of the United Kingdom Forestry Standard in 1998.

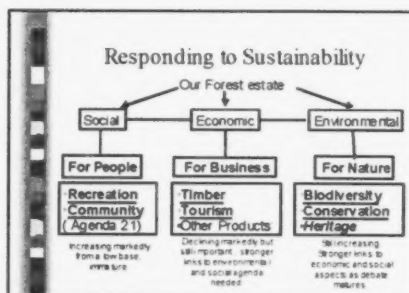
The standard endorses the guidelines for landscape design and other aspects of forestry such as water, nature conservation, and lowland landscapes. It also defines when and how the guidelines should be applied, and is the standard for the landscape aspects of the U.K. Woodlands Assurance Scheme for certification.

The application of the guidelines in a variety of forests and forest design plans was assessed by an independent panel of landscape architects in 1998, who reported to the Forestry Commission late last year.

Whilst the sample was very small, it was large enough to indicate significant variation in the degree to which the standard is being achieved. In the landscape where the guidelines are being positively applied, they seem to be working well, but I can not say what the response of the policy board will be. Speaking personally, I would expect more consistent methods of frequent monitoring and of signing off of visual standards to be needed and that would lead to a greater demand for training.

The diagram shown here to the right is considered by senior managers to describe our current position with regard to sustainability.

The design and management of our visual resource has a major role in converting the progress of this agenda into action on the ground. One potential barrier to such progress is the view that landscape design is confined to heritage alone when in fact it has an effect on all the underlined activities. In fact, it is our greatest social programme to date.



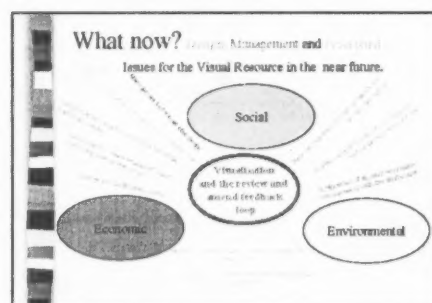
Resources are very tight across the global forest industry at present, but if we are to add value to our forests as suggested above, the design and management of our visual resource has a major role to play for several reasons:

- Man's emotional response to a visual image far exceeds a rational response to an objective question. This has implications for design consultation and research.

- It is currently our largest social impact.
- Design and management is the point at which physical changes to the forest are decided.
- The effective delivery of the above agenda from limited resources depends on focusing research, design and management effort on the *interactions* between the social, economic and social agendas and maximising synergy in their application on the ground.
- A simple qualitative assessment of different issues and practices in our forests in Dorset showed that they interacted roughly as follows:-
 - 30% resulted in unplanned mutual benefit;
 - 35% resulted in designed synergy;
 - 30% resulted in acceptable compromise or trade-off; and
 - 5% resulted in unresolvable conflict –and required straightforward prioritised choice.

The diagram at the right shows where in the context of the sustainable forest model I consider the attention in visual resource management needs to be in the near future.

Whether we are trying to carry out significant research in order to improve the acceptability of our forests, to set priorities, to consult the public or to release the necessary synergy or check visual standards, it is vital that we have a good system for representing the landscape quickly and accurately from a digital terrain model.



Just as the landscape is the demonstration of our environmental credibility, so visualisation needs to be at the heart of our design, research and consultative relationship with the public.

However, the most immediate priority is to ensure that the required standards of forest landscape design are met consistently, and for this a good visualisation package is needed too.

In the longer term, we must demonstrate the robustness of our strong design approach to the public before the evidence of further inadequacy is deployed in the landscape (visualisation again). We must keep looking beyond the trees.

Can Logging and Tourism Live Together in the Woods?

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I am fortunate to be the CEO of an organization called the Council of Tourism Associations of BC, or COTA. When describing COTA, I often refer to it as being a miracle. That is because the industry is made up of over 17,000 small to medium-sized businesses, and the challenge of COTA is to represent this enormous industry of so many small parts in an organized way. We do this by bringing together the key sectoral and geographically located organizations around a council table. This includes organizations such as the BC and Yukon Hotels Association, the BC Restaurants and Foodservices Association, the Can West Ski Association, Tourism Vancouver, Tourism Whistler, and the Guide Outfitters of BC. Together we formulate position statements that represent where the industry stands on key issues. Those positions are then represented to government, the business community, the media and back to the industry itself. In doing this, we call ourselves the voice of the tourism industry.

I am excited about being part of this conference because it recognizes that, like other forest users, tourism is a very land-dependent industry. The superb beauty and spectacular wilderness is a large part of what makes visiting this province appealing in the eyes of the world. The fastest growing sector of BC's tourism industry is wilderness tourism—tourism that features the wild beauty of the province. But the tourism industry's dependence on the land extends beyond the largely rural wilderness tourism. As people travel about in the province, they are confronted by dazzling views of mountains and lakes and trees, and it's these views that keep them coming back to the province time and again. Urban tourism depends on the backdrop of beauty that frames BC's cities. As a result, the quality of the resource is an important commodity for the success of BC's tourism industry. It is the focus of the promise that we make to potential visitors when we market the province as "Super,Natural British Columbia." For that reason, it's vital that the scenic quality of the resource be retained in all of the places that tourists go.

So just how valuable is tourism anyway?

It is the number one industry in the world. According to the World Travel and Tourism Council, tourism makes up 11% of the world's GDP. That's \$3.5 trillion dollars U.S. It accounts for 200 million jobs or every 1 in 12.4 jobs in the world. By 2010, tourism's contribution to the world's economy is estimated to grow to 11.6% of the global GDP or \$6.5 trillion and support 250 million jobs.

In BC, tourism is a \$9.2 billion industry, accounting for approximately one-fifth of the total Canadian industry. The industry employs about 111,000 people directly, or 1 in every 13 jobs in the province. It is the second largest earner of export income, second only to wood products. In 1998, tourism GDP was \$4.9 billion. In current dollars, tourism GDP grew by 57.4% from 1989 to 1998, while agriculture grew by 41.3%, forestry decreased by 2.5% and fishing fell by 13.3%. Tourism GDP grew from 45.1% of forestry GDP in 1989 to 72.7% in 1998.

Tourism interests cross many departments of government, from forestry and highways, to health, environment and parks. Despite its impressive growth, tourism is just one of three responsibilities of the Ministry of Small Business, Tourism and Culture, making us a bit player in the halls of government. The ministry itself is a fraction of the size of other resource-dependent ministries, making it difficult if not impossible for tourism ministry representatives to sit at the many critical tables at which its representation is essential.

In addition, tourism is not entrenched in the decision-making process around land use, whether that be in Victoria or at the local district level. For that reason, COTA has been advocating for our minister to be one of the Forest Practices Code ministers, and for the tourism ministry to have "designated tourism officials" in every region.

In this province, the forest is the traditional domain of the logger. Tourism is the newcomer. For us, a 30-year-old lodge in the wilderness is well established and could span two generations. For forestry, 30 years is just half of a growth cycle. It's when that lodge that was established midway through a growth cycle is suddenly faced with the loss of its scenic quality by the harvesting of the mature trees that we run into problems.

So the question is: Can logging and tourism co-exist in the woods?

COTA believes that they can, and that the answer lies in early consultation and communication between these neighbours in the woods.

Forest companies are required to devise detailed forest development plans (FDP) when contemplating the harvesting of any expanse of forest. These plans include a consultation process during which tourism operators have an opportunity for input. Tourism operators are too often not included in the consultation process because they did not know that development was being planned, or they don't know how to participate in the process, or they have a general lack of understanding of the technical terms and other aspects of the process.

Take Knight Inlet Lodge, for example. The lodge employs 11-16 people during the seven months that it is in operation and five year-round employees. Gross revenues are around \$1 million annually. The lodge is a grizzly bear viewing resort and is located in Glendale Cove, which is part of Knight Inlet, north of Campbell River. Prior to the development of a forest plan for the area, neither the respective forest licensee nor the lodge made an attempt to contact one another to discuss land use concerns and/or plans. Consequently, the forest development planning process commenced and resulted in a proposed plan to harvest 13 hectares of alder trees across Glendale Cove, directly in the viewscape from the lodge. It was also an area that was subject to a high concentration of grizzly bears, and it was certain to affect the grizzly bear viewing operation as well. Although the public was informed of, and invited to comment on, the proposed plan through an advertisement in the newspaper of the District Manager's area, the lodge was not notified individually (even though the lodge was the only occupant of Glendale Cove) and the lodge owner was not aware of the advertisement. The lodge owner became aware of the proposed FDP just before it was to be approved, and only then did he let the forest licensee know of his concerns. Despite his concerns, the plan was approved.

What we learned from this example is that the lodge owner did not know enough of the process to be vigilant for the advertisement, nor did he make an attempt to build a relationship with the licensee in question. Foresters should be encouraged to exceed the requirements of the FDP process and contact the lodge owner before any money is spent on planning—way before the FDP is submitted.

Events happened differently for Big Bar Ranch located near Clinton in the Cariboo Region. In 1995, the forest licensee in the area contacted the owner of Big Bar and stated that the company wished to log the old-growth Douglas-fir on the slopes of the mountain immediately east of the ranch which provided extensive scenic views. A meeting was arranged between Big Bar and the logging company to discuss harvesting and land use plans. The outcome of the meeting was positive, with the working out of a solution that minimized impact on the ranch's viewscape while at the same time providing economic return to the forest company. The agreement was that a maximum of 50% of the cutblocks would be harvested and that all logging would occur during the winter months of November, December and January when occupancy levels at the ranch were lower. It was also agreed that logging would be conducted with the use of a helicopter to minimize road building. After the proposed FDP was approved, logging commenced and was carried out over a two-year period. Guests at the ranch lodge didn't notice the logging when it actually occurred, and once logging of the area was completed, cut areas were difficult to notice from the lodge. Both the Big Bar Ranch and the logging company were extremely pleased with the results and the willingness of each other to negotiate a mutually acceptable solution.

Often these conflicts can be resolved on a business-to-business basis, but Ministry of Forests officials play an important part as well. This is well illustrated in the case of Tweedsmuir Lodge.

Tweedsmuir Lodge is located in the Bella Coola Valley in the Cariboo Region. Tweedsmuir Provincial Park, overlooking Milliken Mountain, surrounds the lodge. The area attracts visitors from around the world who go to see its magnificent views and experience the wilderness. The lodge, which has been in place for 70 years, has become a historical fixture of the valley.

Early in 2000, the owner of the lodge discovered that the proposed FDP within the Milliken Mountain area called for logging activity to take place directly across from the lodge. A letter was sent to Interfor—the forest licensee responsible for the plan—expressing the lodge owner's concerns that the proposed plan would have a significant negative impact to the lodge's operations. A meeting was requested to discuss the issues.

Interfor subsequently replied. The Operations Forester explained that, due to the small operable land base of the entire Timber Supply Area within the Midcoast Region, there were limited alternatives to maintain a viable forestry business. For this reason, the Operations Forester indicated that it was not justifiable to stop harvesting in the area, but rather, that visual quality needs could be managed, thereby achieving both recreation and forestry objectives. As a result, Interfor agreed to perform a Digital Terrain Model that would show the visual impact as viewed from the lodge and present the results at a future scheduled meeting.

However, at the meeting, the Digital Terrain Model was not complete and only examples of similar types of logging in other areas of BC were presented. Following the meeting, Interfor reassured the lodge owner that the company would not pursue any harvesting permits for Milliken Mountain until the following meeting in late June when visual impact results would be generated by the model. Further, Interfor committed to finding a way to conduct timber harvesting in a manner that did not unacceptably alter the visual values from the lodge.

Subsequently, the lodge owner discovered that Interfor had to reach a decision by the end of May, prior to the promised meeting in June. After the lodge owner advised Interfor of the timing conflict and his concerns about this, Interfor agreed that it would request that the District Manager not render any decisions until the company had had its June meeting and reviewed the Digital Terrain Modelling results.

A letter was then issued by the District Manager, in which he confirmed that the FDP for the Milliken Mountain would not be approved. This decision placed the responsibility for consultation on Interfor and Tweedsmuir Lodge, who must work together to bring forward a balanced recommendation on how to manage the forest in this area.

Responsibility for prior consultation is a two-way street. Not only is it in the best interests for peace in the woods for the logging company to consult with the tourism operator, it is also in the best interests of the tourism operator to build strong relationships with the forest licensees in the area so that consultation can be enabled before the FDP is put together. For this reason, COTA has sought a working relationship with its association counterparts in the forest industry in the interests of building an education base for components of both industries.

COTA's two agreements with the forest industry reflect our desire to find business-to-business solutions by which we can live together in the woods. The first is our accord with the Council of Forest Industries and the Forest Alliance. The basis of this agreement is that we will treat each other with mutual recognition and respect. This means that the forest industry will not dismiss us as popcorn-sellers, and we will not dismiss the forest industry as rapers of the environment in front of our international visitors. The accord recognises the complementary nature of the two industries and the need for each to have certainty of access to the land.

Our second agreement is actually a memorandum of understanding with the Private Forest Landowners Association. It is guided by the same principles of recognition and respect that characterize the COFI/Forest Alliance accord. However, it goes further in promoting the concept that we are neighbours in the woods, and in stressing the over-arching principle of maximizing each neighbour's economic benefit—understanding that there will be trade-offs on both sides.

Our discussions with the Private Forest Landowners Association stressed our mutual commitment to promote a better understanding of each other's businesses and the relative impacts and influences those businesses have on each other's interests. Both associations have agreed to educate their respective members on the need for early and ongoing dialogue and for agreement between members who are neighbours in a specific geographical area. This will cover topics such as scenic landscape, acceptable noise levels, timing of operations, access to wildlife

areas and private forest roads. Fundamental to the agreement is a recognition that respects private property rights and cost implications for both the tourism operator and the forester.

A particularly sticky point in the negotiations was the issue of government policy. COTA had made it clear from the start that we were concerned with the fact that tourism interests and values are missing from much of public policy, particularly as it pertains to the land base. On the other hand, the forest industry is wary of anything that might lead to more government regulation in an already over-regulated industry. Together we agreed to promote government policy and regulation that is fair, efficient, environmentally sound and fiscally responsible. It should also protect tourism and private forest owner land values, as well as owners' and operators' freedom to manage. We agreed to encourage government to create incentives to promote mutual business opportunities—in an atmosphere that is results-based, rather than prescriptive.

Unique to the memorandum of understanding is the articulation of a series of protocols that are designed to support a beneficial, ongoing business relationship and to avoid conflict between our respective members co-existing in a given geographical area. These are built around the concepts of early consultation, mutual promotion, and the pursuit of mutual business opportunities.

It was agreed that members of the Private Forest Landowners Association and COTA whose interests are in the same general geographical area would be encouraged to make themselves known to each other, and commit to ongoing, two-way communication, particularly in known sensitive areas, with the objective of reaching early agreement on aspects that affect each other's operations. If they have difficulty in resolving differences one on one, our two associations will commit to an issues resolution process which is articulated in the agreement.

Another protocol revolved around achieving recognition and respect at the local level. We agreed to promote to our members the concept of educating their clientele on current business practices used by each industry, as well as on economic and policy issues and the contribution of each industry to local and provincial economies.

Finally, the protocol outlined our agreement that early consultation and promotion would lead to the identification of mutual business opportunities as a result of a beneficial ongoing relationship.

We have our success stories. An example of where a viewscape issue was successfully negotiated is around the restored gold-rush town and major tourist draw known as Barkerville, near Wells, BC. When West Fraser Timber wanted to harvest an area on Cornish Mountain, right behind Wells, there was an outcry from the community. The problem was with the visual aspect from certain points on the road coming from Barkerville. After countless meetings with community representatives, West Fraser decided to scratch the idea of clearcuts and move to small patch openings.

Accessing the backcountry is another way in which foresters and tourism operators can work successfully together. Whether they're driving a boatload of tourists to a favourite fishing hole or looking for a good kayaking launching spot, tourism operators depend on thousands of kilometres of roads, built by forest companies, to help them access the backcountry.

For example, as West Fraser continued working with the residents of Wells, it was discovered that if logging roads were kept narrow—just wide enough to accommodate a logging truck—the roads could be used for cross-country skiing in the winter. This allowed Wells to further develop its tourism appeal and diversify its economy.

Another concern is the noise and disruption from logging operations during the tourism high season. This is inevitable when both operations are trying to take advantage of the summer weather to get their jobs done. Many tourism operators, especially those in adventure tourism, depend on the short summer season to make their annual income. Unforeseen interruptions from noisy logging operations are particularly hard to deal with if they occur without warning. Guests who have paid for a wilderness experience are not likely to return if the wilderness is punctured by the sound of heavy machinery, logging trucks or helicopters.

However, with early consultation, this too can be managed. Fishing lodge owners in Rivers Inlet, for example, were concerned about an initial harvesting plan for nearby Walbran Island that promised to be noisy and disruptive to the busy but peaceful summer fishing season. Walbran Island is located near the mouth of the inlet, central to fishing boat traffic in and around the area. Because there was no prior consultation, Interfor didn't even know that there was a problem until the lodge owners started writing some very angry letters. The meetings that ensued resulted in Interfor selectively helicopter-logging the whole site in the spring, before any visitors arrived for the fishing season.

Today we have seen several examples of where tourism and forestry have developed relationships that sort out problems—usually with a satisfactory conclusion. The differences lay in how we got to the conclusion. In each case, it was far less costly in time and money for all concerned if the consultation took place prior to the development of an FDP. We are encouraging our tourism operators to establish a relationship with the Ministry of Forests and the local forest licensees from the very beginning, and to ensure that the relationship is continuously fostered. We are encouraging forest licensees to contact affected tourism operators before the FDP planning process begins. We are also encouraging the Ministry of Forests to instruct local forest licensees to contact tourism operators who will be affected by a proposed FDP, once the FDP is submitted to the District Manager. We are encouraging the tourism operators to get involved in the 60-day window for commentary on proposed plans, and we are encouraging the District Manager, the forest licensee and the tourism operator to meet and attempt to arrive at a mutual agreement before the proposed FDP is approved.

We recognize that it is in both industries' best interests to sort out the conflicts and to find a way to live together as neighbours in the woods. There are good reasons for us to support the health of the forest industry. The best argument is that tourism is dependent for its health upon a thriving BC economy, since over 50% of tourists come from within the province. For the forest industry, tourism can substantially effect a more positive public image of forest management in BC amongst our visitors, many of whom are from Europe.

This is the point at which tourism and forestry come together, nurturing business-to-business relationships that will ensure that both industries can sustain themselves. Our two industries'

cumulative business drives a large part of the BC economy. Working together strengthens our ability to affect that economy in a positive way.

So, in answer to the question Can tourism and forestry get along in the woods?, the answer is a very positive yes. Building relationships between the two industries is a delicate, often sensitive, balancing act, but it can and is being done. As we look to our future, we can see that efforts such as our two accords are laying the groundwork for doing it better. We look forward to the establishment of more productive relationships as time goes on.

From the Scenic to the Ecologic: Continuing Issues in Managing for Forest Aesthetics in Messy Situations

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Introduction

Celebrated in song, verse and art, the North American landscape holds important utilitarian, symbolic and spiritual meanings for its peoples. The immensity, diversity, naturalness and overwhelming grandeur of this landscape is a rich source not only of commodities necessary for our way of life, but also of the pure water and clean air that supports life. Moreover, this landscape serves to both inspire and challenge us. As we interact with this magnificent landscape, we seek to determine how we can be better stewards.

As with the landscape we endeavor to manage, our search for stewardship is confronted by seemingly impassable mountains and deep canyons, which may function as barriers in this search. The search is not new. For many land managers it started with the Monongahela and Bitterroot controversies of the late 1960s and early 1970s. In these settings, as in many other less publicized ones, foresters and their publics battled over the technology of timber harvesting, site preparation, road construction and the effects of these activities on the landscape meanings deeply valued by many. As this meeting suggests, this discussion is not over. The evolving and often unpredictable character of public preferences and values raises new questions about how we, as professional land managers, provide the stewardship for this superlative landscape.

Providing visual stewardship for the working forest is a real challenge, not only because of confusing terminology and complex and poorly understood concepts, but also because of its multifaceted character. There are three particularly thorny aspects to this challenge:

1. Confounding the notion of a natural landscape with that of a natural appearing one;
2. Understanding that landscape aesthetic is an evolving meaning, as potentially dynamic
3. as the landscapes with which we interact; a social/political context, slippery and muddled as it is, within which we make landscape management decisions.

These three factors act provide a confusing, if nothing else, policy environment in which to practice landscape stewardship. In this presentation, I will review each of these three dimensions of the landscape aesthetic management issue.

The meanings we attach to landscapes result from our interactions with them and are influenced by a host of significant factors, such as our evolutionary heritage, our social and demographic backgrounds, our previous experiences with landscapes, and, of course, specific landscape attributes. A thicket of stagnated Douglas fir reproduction in a miniature ponderosa pine stand provides a useful example. To a forester, the thicket would represent an overstocked condition, a

situation where the individual trees are competing with each other to such an extent that none can receive adequate nutrients for acceptable growth. To a fire manager, the thicket represents a potential ladder fuel situation, heightening the risk of wildfire to nearby homes located in the urban/wildland interface. To my daughters, who played in this thicket for many years, it was the enchanted forest where they played out their own fantasies and rehearsals for adult life, and it will always be so. Each of these landscape meanings is influenced by how we have been trained to look at the world. Each meaning is in a sense correct, yet they are all to some extent incompatible. These definitions of places, and the attachments people put on them, influence—even determine—how people behave in and toward the landscape, and how they will respond to management activities.

The notion of a “working forest” suggests an instrumental or utilitarian definition of a landscape, one that is assigned by the bureaucracy (private or public) and which may or may not be compatible with other definitions either now or in the future. As meanings evolve, it becomes increasingly problematic as to how differences in meanings will be negotiated and resolved.

It is quite clear that the meaning of a landscape as one that is aesthetic continues to evolve. The glorious landscape of the romanticist era (of Bierstadt, Bodmer, and Moran and other 19th century artists)—the landscape of awe-inspiring mountains, placid lakes, gargantuan trees, brilliant sunsets, and diminutive people—represents the scenic aesthetic ideal that many of us highly value and many have fought to protect. But the notion of a landscape aesthetic continues to evolve, with the idea of an ecological aesthetic emerging—a notion that the biophysical forces that gave rise to natural landscapes have a beauty in themselves. This emerging meaning advances new problems, tremendous challenges, intricate questions, and complicated issues. Our job as stewards of the landscape is to understand these evolving meanings and implications.

In this presentation, I want to try to help frame the challenge of evolving meanings of landscape aesthetics. Problem framing in landscape management is particularly difficult because of competing goals, diverging values, imperfect science, and a seemingly over-riding need for instant gratification about what we should do for management. If we have learned one thing in landscape management, it is that too often in our hurried rush to come up with answers, we fail to ask the right question, we end up solving the wrong problems, we solve a solution, or we state the problem in such a way it cannot be solved. So, this talk offers no easy solutions, provides no useful data, and advances no simple recommendations. There are no answers in this presentation. What I can do is provide a perspective on the character of the challenge of evolving meanings of landscape aesthetics, identify several of the particularly thorny issues that result, and suggest implications for how we develop and implement a policy of landscape aesthetic management for a working forest.

There are three dimensions to the challenge of landscape management in this era of evolving meanings. The first dimension of this challenge is the tendency to confound natural and natural appearing landscapes. The second dimension is the emerging meaning of an ecological aesthetic. The third dimension concerns the social/political context in which landscape management decisions are made. I will discuss each in turn.

Natural Landscapes Vs. Natural Appearing Landscapes

The wild and self-willed character of ecological processes combines with local geomorphology to result in landscapes of often startling and inescapable beauty. When absent of human activity, it is the landscape we have come to appreciate and expect to see preserved in national parks and protected areas. But not all natural landscapes contain magnificent scenic beauty. Some are downright unattractive.

A natural landscape should not be confused with a natural appearing landscape—one that looks as if it is natural but in fact may have been created or modified by humans. In some cases, the modification has been done explicitly to enhance scenic quality. In other cases, the modification has been done for other purposes (for example, the farming landscapes of the English countryside) yet still results in an attractive, appealing landscape. In the working forest, the utilitarian character of the landscape suggests that it may not be, in fact, natural, but through the judicious use of technology and design principles, and sensitive on-the-ground operations, a natural appearing landscape can be made to be visually appealing.

Evolving Definitions of Landscape Aesthetic

The second element of the visual stewardship challenge involves evolving definitions of the landscape aesthetic. With the rise of the romanticist art of the 19th century, no longer were forests and mountains viewed as dark and foreboding, sinister and threatening, but rather as magnificent, even dazzling, scenes of trees, streams, wildlife, lakes and geology combining in an almost inspirational way. It is this definition of a scenic aesthetic that has been at the root of many forest conflicts, and it is this meaning we attempt to achieve through all the mitigation technology and processes that have been developed. The scenic aesthetic remains a powerful story, and important component of our quality of life, a central component of the nature-based tourism industry, and a resource that often augments community economic development pursuits.

Yet the notion of a landscape aesthetic is evolving, potentially destabilizing our newly created approaches to visual quality. Increasingly, people are speaking of an ecological aesthetic, an aesthetic that some attribute to Leopold, with major interpretations by Gobster. In the ecological aesthetic, beauty results not so much from our visual insight, but in our ability to sense, understand and appreciate the natural processes that brought a landscape to its present condition. An ecological aesthetic meaning is more a function of careful scrutiny, more a result of understanding the mechanics of ecology, and more related to our ability to mentally take things apart and put them back together than a scenic aesthetic meaning. As I say this, I don't intend to imply that one aesthetic meaning is better than the other. They are just different.

An ecological aesthetic establishes positive feelings out of landscapes that, in a scenic aesthetic, would be viewed negatively, such as a ridge containing massive blowdown timber resulting from the Mount St. Helens eruption in 1980 or a typical burned-over lodgepole pine stand that occurs in many Northern Rocky Mountain forests. In both cases, we can come to understand the powerful combination of processes and conditions that led to the far-reaching landscape changes that will be with us for our lifetimes. In that recognition lies a sense of beauty; the scenes are not necessarily pretty, but they're definitely interesting, fascinating and provocative.

These meanings of landscape aesthetics are not always divergent. White River Park in the Bob Marshall wilderness of Montana demonstrates this dilemma. White River Park contains a beautiful old-growth stand of ponderosa pine, widely spaced with a predominantly grass understory. It represents a landscape that is at once natural and holds both a scenic and ecological aesthetic. The ponderosa pine stand here resulted in part from a combination of frequent low intensity and naturally occurring fire and appropriate soils and climatic conditions. Thus, understanding and appreciating these processes leads to an ecological aesthetic and, at the same time, landscape itself represents an outstanding scenic aesthetic.

Scenic and ecological aesthetic meanings vary on the variety of variables, as shown in this rather reductionistic table (Table 1). The important differences, in my mind, relate to the implicit assumptions about the character of ecosystems, the theoretical foundation for preferences, and the degree of social acceptability each practice represents. For example, the scenic aesthetic assumes a rather static representation of ecosystems, while the ecological aesthetic allows for a dynamic ecosystem. The preferences for a scenic aesthetic are probably founded upon evolutionary and human and adaptive processes, such as those put forth by Ullrich, Parsons, and the Kaplans. In the vast majority of cases, managing to enhance scenic quality is socially acceptable, while there is some question about the practices that lead to an ecological aesthetic, as these practices often are difficult to view and to understand.

Table 1. Some distinguishing of characteristics of scenic and ecological aesthetics

	<u>Ecological</u>	<u>Scenic</u>
Visual Appearance	Chaotic	Neat, uncluttered
Structure	Closed, multiple	Open, park-like
Implicit Assumption	Dynamic	Static
Foundation	Social/political	Adaptive/evolutionary
Focus	System needs	Human needs
Acceptability	Unknown	High
Informed by	Ecology	Landscape architecture

Decision-making in Messy Situations

The third dimension of this problem deals with the social and political environment within which decisions about landscape management are made—a human landscape that is difficult to understand, constantly in a state of change, permeated by competing values, and where the power to influence and veto plans is held by different groups at different times. In short, this human system is non-linearly dynamic.

We can briefly and simplistically describe the situations in which landscape management decisions are made based on the degree to which management goals are conflicting or agreed-upon and the degree to which scientists agree on cause and effect relationships. I don't have time to mount an argument, but my proposition is that as we move into a new aesthetic, we will find that landscape goals are conflicting and scientists increasingly unable to provide answers. This situation is called a messy situation, with settings where one problem is linked to other problems.

In these settings, problems never stay solved because the context is always changing. But most importantly, the planning models and technology we have become accustomed to using and which are appropriate for tame problems lose a lot of their utility in messy situations.

Issues Arising from Evolving Meanings

There are three major issues that arise out of the evolution of meanings of landscape aesthetics. The first issue arises out of the fact that different meanings are held by different individuals. Since there is a growing diversity of voices expressed about the management of public and private forest lands, there is increasing responsibility for land managers to determine for whom the lands will be managed. In this case, the issue is: for whose aesthetic shall we manage? The second issue deals with the relationship of landscape aesthetic as part of tourism and recreation experiences. Scenic landscapes are important in enhancing tourism and recreation. There is a question about how an ecological aesthetic will fit into tourism and recreation. Nevertheless, differing forms of landscape aesthetic will require greater integration and research, planning, and landscape management decisions. The third issue deals with the fundamental assumption about the character of an ecosystem that is represented by both scenic and ecological aesthetics. Scenic landscapes implicitly assume that the underlying ecosystem is static. In a sense, the view that is in a particular scene has always been there and always will. Yet we know that landscapes are incredibly dynamic, to some extent unpredictable, and capable of surprises. Maintaining a landscape that is a static representation of a dynamic system requires increasing inputs of energy in the form of management to maintain a landscape in the face of change. An ecological aesthetic does not make the same implicit assumption, yet many of our ecosystems are currently on a developmental pathway that is very different from what would happen had humans not interfered. It will take, in many cases, creative management to return ecosystems to the conditions that would allow natural processes to take over again.

Implications

There are a number of implications that develop out of this changing landscape aesthetic. First there are some implications that deal with the distribution of costs and benefits of differing forms of aesthetics. Since different groups of people likely preferred different kinds of aesthetics, the manager is confronted with who will be paying costs and who will be receiving the benefits of these landscape aesthetics. These are likely to be different individuals. The second implication is that there are shifting responsibilities for decision-making, and it is not clear who will be making the decisions for whose landscape aesthetics. In an ecosystem-based management process, managers, the public and scientists are usually joined together in a collaborative process to make decisions. In many cases, in ecosystem-based management there is an emphasis on scientific information versus other forms of knowledge. This leads to a situation where managers and scientists are privileged in any decision-making process, while there is increasing potential for anecdotal and experiential forms of knowledge to be marginalized. Closely related to this implication is the need for venues that will provide opportunities for people to do the work needed to address and resolve the complicated issues of landscape aesthetics arising in messy situations.

Another implication is the need for changes in information and public involvement approaches required as a demand for ecological aesthetic increases. An ecological aesthetic requires much

more in the way of cognitive processing than does responding to scenic views. This suggests the need for new venues where people can interact in a non-threatening way about the complicated issues of landscape management. It means that managers will be spending more time communicating information about ecological processes. In addition, the management actions needed to produce an ecological aesthetic, as well as the natural processes involved (insects, disease, fire,) often lead to consequences that are difficult to understand and difficult to appreciate because these consequences are often not scenic.

Another implication is that there is an increasing demand to seek integrated resolutions between management and aesthetics. The technology for managing for scenic aesthetics is well established and can be used in a collaborative sense with the public. Basic design principles and scenic management handbooks have articulated this knowledge well. To produce the knowledge needed for an ecological aesthetic may be more problematic and may be more difficult to integrate with other land uses.

The competing paradigms landscape aesthetics and confusion or responsibilities is another implication. While public land management agencies often have been legislatively mandated to respond to the demands for a scenic aesthetic, the private sector has been more reluctant to adopt such practices. There is an important implication here in terms of who will be responsible for providing what landscape aesthetic and where. Is it the private forest industry's responsibilities to provide an ecological aesthetic? Is it appropriate to seek an ecological aesthetic on a working forest? Should such aesthetics be achieved only in visually sensitive places or across the landscape?

Finally, there are costs associated with achieving varying kinds of landscape aesthetics. The costs to achieve a scenic aesthetic are becoming more well known. Aside from who should pay for these costs, there are significant questions about what the costs would be for an ecological aesthetic, and what kinds of impacts such seeking of aesthetic might have on other policy such as international trade.

Conclusion

So, this journey that we called visual stewardship is not an easy one. It is filled with the inescapable trap of changing public preferences, it is threatened by rigid views of the world, and it is often imperiled by social and political forces beyond our control. Managers of the working forest, nevertheless, should be encouraged by their progress in responding to demands for scenic aesthetic. That these aesthetics are changing should not be surprising. Now along this journey we will be tempted with differing destinations, offered alternative pathways and introduced to new technological companions. Protecting where appropriate, and enhancing where needed, our unparalleled scenic and ecological aesthetic is the challenge we share in this journey. It is tough to deal with revolving meanings of landscapes and emergent definitions of landscape aesthetics, but there should be no question that all of us are up to it.

Visualization as a Decision Support Tool

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Visualization as a Decision Support Tool

- Target audience -- different methodologies to get at the opinions of various "publics" (eg. the process for local residents may be very different from that for the international community)
- What do I mean by decision support?
 - The decisions for it has a number of goals
 - simplify information
 - communication
 - resolve conflict and come to consensus
 - ultimately, to make decisions

There's a distinction to be made between highly structured decision support systems and the more unstructured role of visualization within general land management decision-making processes

- If visualization technology is to be useful in this more unstructured decision support capacity (that is to support the decision-making process), a number of challenges must be met.
It must:
 - be tied the scientific models
 - produce credible output
 - address variables salient to the public
 - be easy to use
 - respond quickly
 - be accessible
 - and it must simplify things rather than make them more complex
- In order to investigate how we might go about solving some of these problems the Collaborative for Advanced Landscape Planning (CALP) was created.
<http://www.calp.forestry.ubc.ca/>
- The Arrow IFPA project as an example
 - investigate landscape design scenarios
 - new visualization tools to show future force conditions
 - increased public involvement in this process

- The visualization process

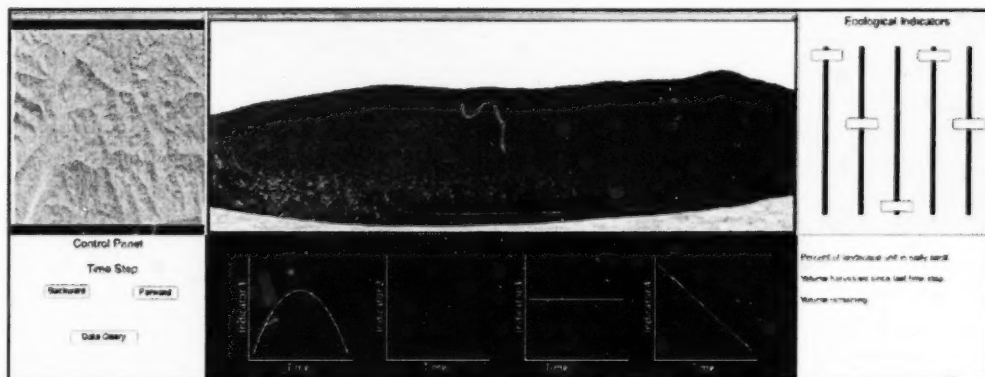
In order to address some of the goals of a publicly usable visualization system CECIL was created. CECIL is a computer program that links a number of forestry modeling programs such as FORECAST (a stand attribute model), ATLAS (a landscape level blocking and scheduling program) and SIMFOR (a wildlife modeling program). Output from all of these programs are then synthesized by this visualization system and the outputs are then sent to a rendering engine. The strength of this approach is that CECIL can be linked to accept information from any relevant model and produce output for many different renders. This approach was then applied to the Arrow Forest District located in the West Kooteney region of southeastern BC and is approximately 1,400,000 hectares in size.

- In this example visualizations were used to:
 - illustrate proposed scenario impacts on visual quality overtime
 - show remote locations that may be relevant to recreation and tourism
 - add standard data visualization to illustrate ecological issues such as habitat
 - illustrate the timeframe of regeneration and rotation

Visualization can be used in a great variety of ways but how we tie it altogether in a framework that allows the public to interactively investigate the full range of land management decision possibilities in order to more proactively include the public in this decision-making process is the real issue.

We are currently developing a number of user interfaces that began to make this possible that allow people to:

- play "what if" games
- isolate the effects of a single variable (sensitivity analysis)
- optimize across a range of goals



New Forestry Versus Old: A Political Taxonomy of Public Perceptions

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Study 1: General Public Perceptions of Forest Harvesting

Perspectives About Clearcutting

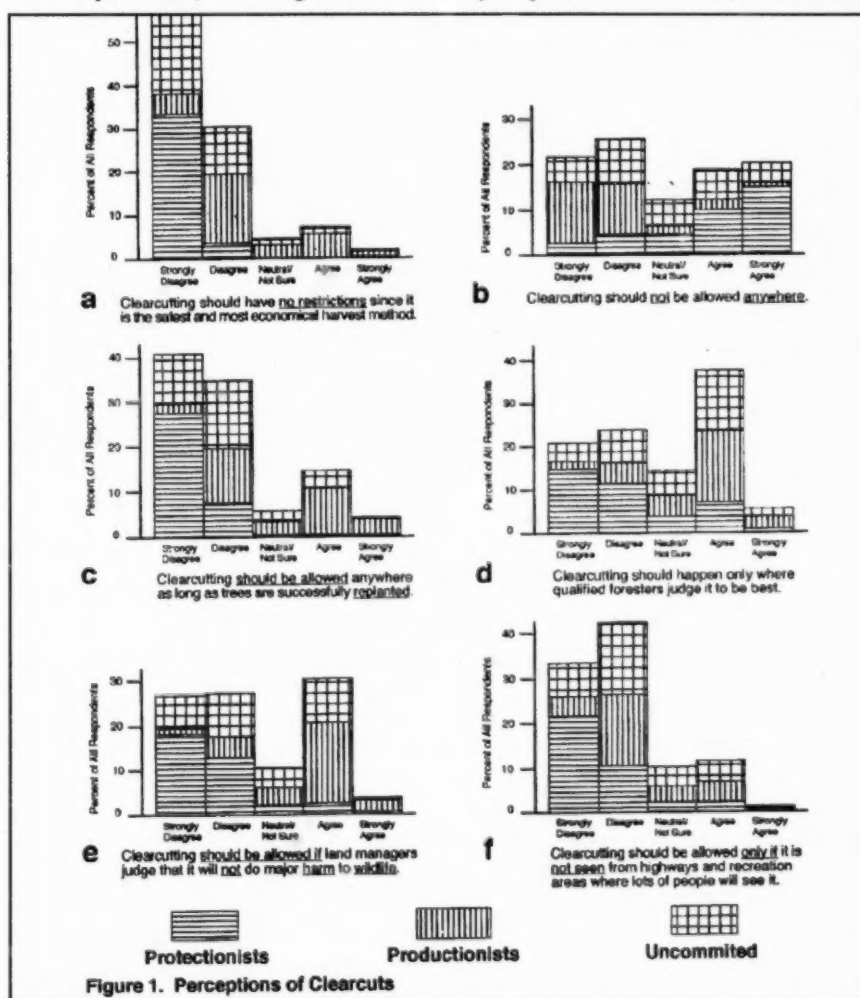
Unrestricted clearcutting is clearly unpopular among all respondent types, although less passionately so among the productionists (*fig. 1a*). This general opposition to clearcutting is consistent with Hansis (1995) findings, although he found such views to be more complex when clearcutting policies come into play. The other clearcutting items in this study (*fig. 1b-f*) therefore explored how different restrictions upon clearcutting were viewed by the respondent groups.

The pattern of responses in figure 1b exhibits no strong direction favoring or against an outright ban on clearcutting. This distribution of responses (*fig. 1b*) exhibits a pattern strongly diagnostic of the respondent categories. A majority of protectionists favor a ban on clearcutting while a majority of productionists do not. The uncommitted respondents were of many, evenly-distributed views with a bias just tipping the overall plurality against a ban on clearcutting. This evenly conflicted pattern suggests a simple ban on clearcutting is not politically viable. Perhaps the NFP's policy of replacing clearcuts with 15 percent green-tree retention harvests that are almost clearcuts is more viable. Further research is needed.

The policy propositions in figure 1c and 1d represent two primary restrictions on national forest clearcuts (other than size) imposed by the National Forest Management Act (NFMA) of 1976 (Wilkenson and Anderson 1987), which the NFP elaborates as case law. The requirement to replant clearcuts (*fig. 1c*) seems insufficient to render clearcuts acceptable by strong majorities of protectionists and uncommitted respondents, with the latter less passionately so. The productionists are evenly split with half seeing the replanting requirement as sufficient and half not. The result is a substantial coalition of opposition to the sufficiency of this clearcutting policy, suggesting the NFP's additional green-tree and woody debris retention requirements may be headed in the right direction to garner public support for regeneration harvests. The majority of disagreement in figure 1c might have been a bit smaller without the word "anywhere," which was included to reflect the common interpretation of NFMA.

The NFMA requirement that clearcutting be "optimal" is embodied in the proposition and results in figure 1d. Overall opinion about this requirement proved evenly divided but with much more passionate opposition than passionate support. Protectionists trust foresters the least to judge the appropriateness of clearcutting with a plurality passionately so. This is likely rooted in basic philosophical differences. A plurality of the uncommitted respondents trust foresters about clearcutting but not strongly. Not surprisingly, a strong majority of the productionists trust foresters about clearcutting.

The largest response category to the optimal clearcutting proposition (*fig. 1d*) was not-strong willingness to trust foresters, with few respondents strongly trusting them. This not-strong trust response consisted largely of productionists, who can be expected to do so, a plurality of uncommitted respondents, and a significant minority of protectionists. But, this number was still



less than the two disagreement categories combined. In sum, foresters retain a significant degree of trust in clearcutting, but they do not have a secure political basis for retaining this authority because many others distrust them, often passionately. This seems consistent with the NFP's prohibition on complete clearcuts, eliminating these as options for foresters, while leaving them with discretion to make decisions subject to this constraint. It is also consistent with a Shindler et al. (1993) finding that the general public has only a moderately high level of trust in government natural resource agency professionals.

The restriction on regeneration harvests that seems most generally embodied in the NFP is the avoidance of major impacts on biological diversity. The proposition in *figure 1e* sought to embody this idea with respect to clearcutting and produced ambiguous results much like those in

figure 1d. While Shindler et al. (1993) found a majority of Oregon residents support greater attention to wildlife in Federal forests, a plurality in this study disagreed with the idea that clearcuts were permissible if they would not do major harm to wildlife. This disagreement, including considerable strong disagreement, consisted of a coalition of majorities of the protectionists and uncommitted respondents (*fig. 1e*). This might be, in part, because they were incredulous of the idea that clearcuts might not do major harm to wildlife. This interpretation is perhaps bolstered by the large majority of productionists (who can be expected to be less incredulous) who supported the proposition. The productionists who believe harvests can be compatible with wildlife, together with a plurality of uncommitted respondents, might form a coalition for this view if the NFP proves successful in allowing harvests while enhancing diverse wildlife populations. But, such a coalition appears not now to exist.

A major thrust in mitigating public opinion of clearcuts under NFMA has been visual resource management (USDA For. Serv. 1996). This practice seeks to reduce the visibility of clearcuts in areas of frequent and/or sensitive public viewing, and to moderate the visual impact of clearcuts in areas of fewer viewers and/or sensitivity. The proposition in *figure 1f* sought to test public responses to this approach.

A strong majority of all three groups disagreed with this visibility restriction on clearcuts (*fig. 1f*). Perhaps they feel the real issues about clearcuts are not about appearances, and/or they don't like the idea of a public land management agency trying to "fool" them. This does not necessarily mean that national forest visitors might not enjoy themselves if the visibility of clearcuts is reduced, i.e. they are not aware of being "fooled" and enjoy the scenery. But, the public evidently prefers an "honest" landscape. Perhaps the NFP offers a better solution. It offers to plan management in concert with watershed and ecological needs and a lesser frequency and intensity of harvests, and the landscapes so produced might be more acceptable in appearance and in perceived content that is understood to go with that appearance (Gobster 1996). More research is needed.

Perspectives About New Forestry

The need for holism in resource management (Shindler et al. 1993, Hansis 1995) was a political force in the formulation of the NFP and its adoption of New Forestry ideas (Yaffee 1994). It therefore seems unnecessary to simply test public support for New Forestry, although some opposition remains (Gale 1991, Dietrich 1992). Instead, patterns of opinion were sought for where or why people might support or oppose new forestry. Interpretation of these results must be conditioned upon the definition statement of new forestry provided to the respondents:

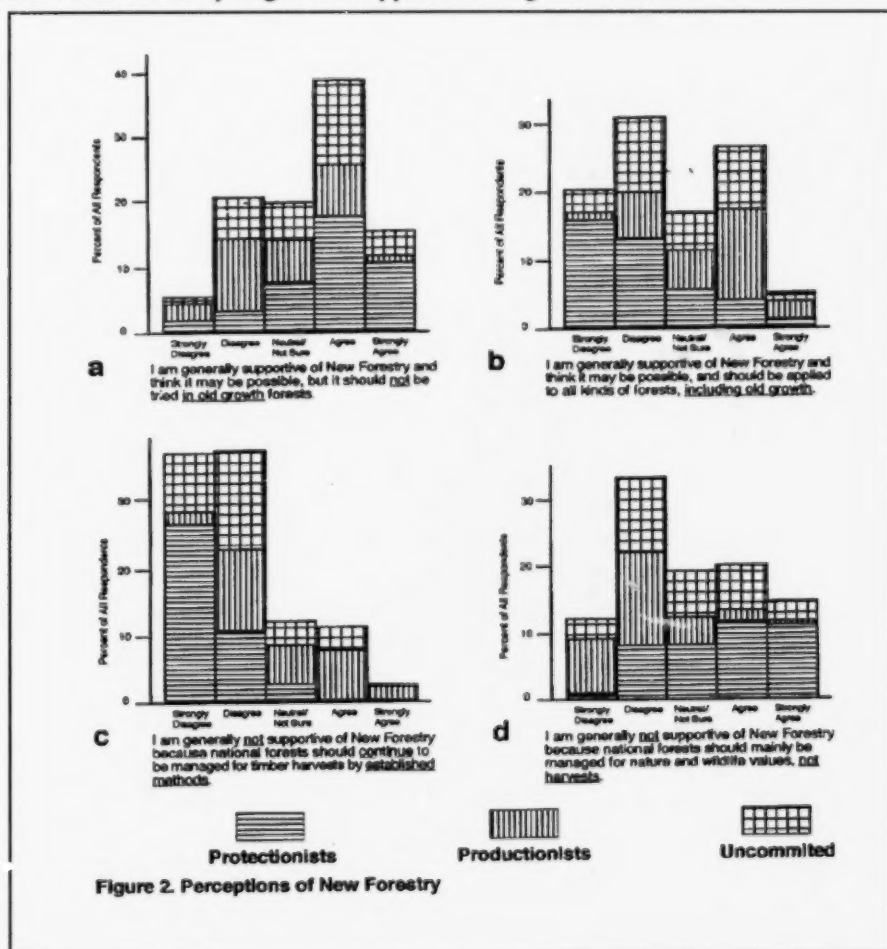
New national forest management philosophies are being proposed called "new forestry," "ecological forestry," "ecosystem management," or "new perspectives." These generally aim to manage forests toward a more equal balance between timber harvests and wildlife habitat than traditional forestry is often viewed as doing.

An important difference of opinion emerged in the response patterns to the two propositions about where new forestry should occur (*fig. 2a and 2b*). A majority of both protectionist and uncommitted respondents support new forestry if it avoids old growth, consistent with Shindler

et al. (1993). Productionist respondents were split (*fig 2a*). Those more inclined to indicate support for new forestry may have responded with agreement; while those more inclined to voice support for continued forestry in old growth may have responded with disagreement; while those caught between these feelings may have chosen a neutral response.

When the proposition shifts to applying New Forestry in old growth (*fig. 2b*), the productionist respondents are no longer indecisive with a majority in support. This seems consistent with their desire to maintain commercial use of these valuable timber sources. The protectionists then decisively reverse position and oppose the proposition, suggesting that they are primarily concerned with saving old growth. And, the uncommitted respondents are now split, perhaps indicating that they felt conflicted about whether to support new forestry or oppose its use in old growth.

The overall pattern in *Figure 2b* is indecisive. The protectionists and productionists cancel each other and the uncommitted respondents are split. This indecisive pattern mitigates against a policy of new forestry in old growth compared to the pattern in *figure 2a* favoring a policy of new forestry with old growth protection. This latter policy is more consistent with the NFP, with its emphasis on new-forestry-like managements in matrix lands rather than in late successional reserves. There remains, however, a clear dispute between productionists and protectionists about whether new forestry ought to be applied in old growth forests.



Majorities of protectionists and uncommitted respondents, and a plurality of productionists, decline to oppose new forestry in favor of established methods (*fig. 2c*). This suggests a mandate for change, although productionists are split with many favoring established forestry. This mandate seems consistent with the NFP and a Shindler et al. (1993) finding that a plurality of Oregon residents oppose a timber-commodity production emphasis in Federal forests.

The pattern of agreement with the statement of opposition to New Forestry in favor of natural values and no harvests is less decisive but informative (*fig. 2d*). The productionists, not surprisingly, are no longer split but strongly opposed to this idea. The uncommitted respondents' views are split but with a plurality leaning toward opposing a no-harvest policy. A majority of the protectionists favor no harvests but a significant number do favor harvests. This minority of protectionists forms a decisive coalition with the majority of uncommitted respondents and most productionists in favor of New Forestry rather than a no-harvest policy. This seems consistent with the NFP, with its continued harvests using new planning and management methods. It does not indicate opposition to nature protection, given the patterns in *Figure 2a and 2c*, and one in Shindler et al. (1993) where Oregon residents favored greater protection of habitats.

Conclusions About General Public Perceptions

Opinion about the northern spotted owl is strongly polarized, especially regarding whether it is worth saving at a high cost. The same evenly split conflict arises over whether clearcutting should be banned. But, there is consensus in favor of New Forestry as opposed to traditional, even-aged forestry, while New Forestry also enjoys a slight edge in political support over no forestry. Concern for biological values accounts for this support for New Forestry, which might be acceptable in even-aged practice if foresters gain public trust by attending to wildlife concerns.

The spotted owl controversy should be alleviated if clearcutting ceases to be part a focal issue. Clearcutting seems to be at the core of the larger conflict, at least to many people uncommitted to either side. New Forestry, with its alternative harvests, might therefor offer as effective a response to the controversy as it may to biological-health concerns in national forests.

Public opinion of New Forestry will depend on how it is explained or comes to be widely understood. This study did not explore the nuances of this problem. One conflict that will likely transcend this issue of definition is whether New Forestry ought to be practiced in old growth forests. There is substantial disagreement on this point between forest protection versus production advocates with uncommitted people currently leaning toward keeping New Forestry out of old growth.

This study suggests policy directions that can affect public acceptance of regeneration harvests in national forests: (1) Foresters do retain public trust to exercise discretion, mainly among forest production advocates and a plurality of uncommitted people. But, there is not a strong consensus of trust among people outside the traditional, timber-resource culture of the region. (2) The requirement that harvests be replanted is popular but insufficient to gain broad public acceptance of harvests. (3) The policy of mitigating the visual impacts, of harvests is unpopular, in principle, probably because it doesn't address larger, more-holistic concerns about- clearcutting and forest

health. (3) Policies that promote the health of wildlife seem most likely to affect public acceptance of timber harvests, but there is much sentiment (with the exception of many forest production advocates) that this goal can not be served just through the regulation of clearcutting.

The Northwest Forest Plan embodies these elements, with its alternative harvests, rather than no harvests or clearcuts, its protections for old growth, and its attention to biological values. The NFP should help regain broader public acceptance of Federal forest management, particularly if its harvests are not perceived the same as clearcuts, if it produces enough economic value to the region when most-needed, and if the ways in which it serves wildlife through decision processes and constraints become widely and credibly understood.

Study 2: Perceptions of the Appearance of Green-Tree Retention Harvests

Introduction

There is a long-standing dilemma between negative public perceptions but with the silvicultural virtues of clearcuts versus their ecological impacts. It lies at the heart of the greater conflicts exhibited in the spotted owl controversy. "New forestry" offers some potential resolution and one example are the "regeneration harvests" prescribed by the Northwest Forest Plan (NFP) in response to that controversy. The success of that plan will, in part, arise from public perceptions and attendant political consequences of such harvests.

A research study (Ribe 1999) explored perceptions of both management acceptability and scenic beauty. In addition, the affect of new forestry information on these perceptions was explored. The study questions were:

1. Are simple, uninformed perceptions of scenic beauty and acceptability for regeneration harvests different than for conventional clearcuts?
2. How does information about the regeneration harvests affect these perceptions?
3. Are dispersed retention patterns more acceptable than aggregated retention harvest patterns, and how does information affect such differences?
4. Are dispersed retention patterns seen as more beautiful than aggregated retention harvest patterns, and how does information affect such differences?

Methods

A set of simulations was generated to exhibit an aggregated retention regeneration harvest, with some dispersed retention as now prescribed by the NFP, and corresponding uncut and clearcut scenes. Another set did the same for a dispersed 15 percent retention harvest.

Four respondent sets rated the scenes. These were selected to be similar to each other in ideological makeup regarding production from versus protection of forest resources (based upon responses to attitude questions regarding forest management) and rural versus urban residence. A set of 320 respondents rated the acceptability of both clearcut scenes, both uncut scenes, and the dispersed retention harvest scene without information amidst 57 other national forest vista

scenes. They also rated the aggregated retention harvest scene for acceptability with information amidst 14 other informed vista scenes. A set of 261 respondents rated the same scene sets for scenic beauty. A set of 251 respondents rated the acceptability of the aggregated retention scene without information and the dispersed retention scene with information with the rest of the scenes the same. 288 respondents rated this second scene sets configuration for scenic beauty.

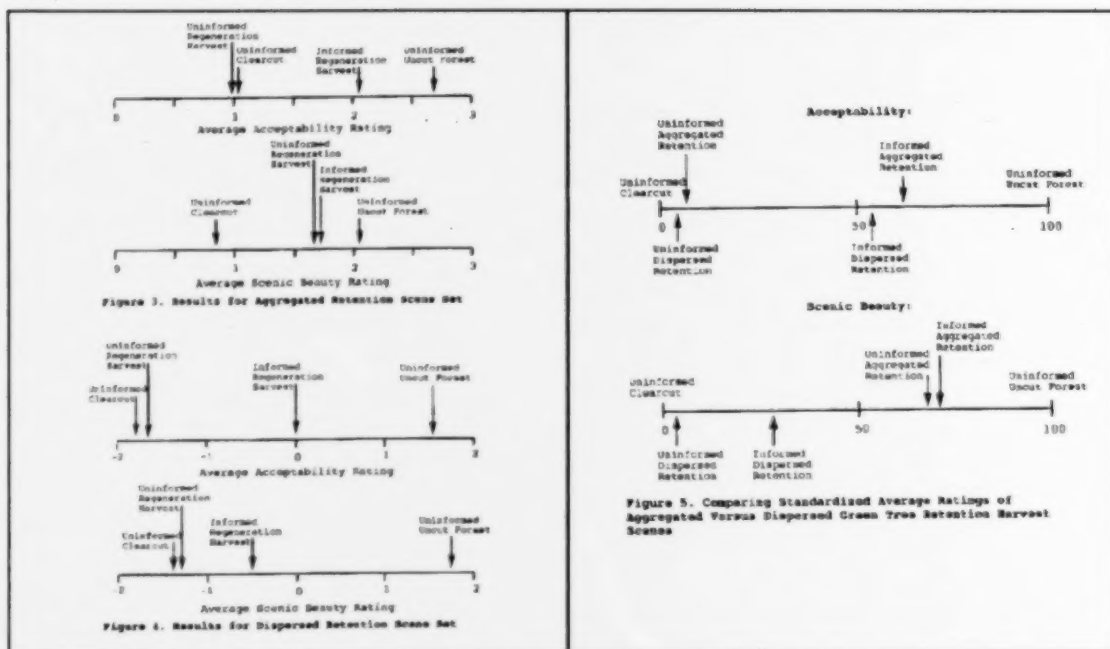
All ratings were made on a scale of -5 to +5 from very unacceptable or ugly to very acceptable or beautiful, depending on the one quality being rated. Zero values were identified as neutral or undecided. The information statement provided was short, but sought to capture the essence of new forestry in the "ecosystem management" context of the NFP. It was, "This harvest left 15 percent of the living trees standing as future habitat and a way of helping the ecosystem reestablish itself as a new forest grows back there."

Average ratings were then simply compared to inform the study questions, using t-Tests to test for significant differences at the $p=0.01$ level. To compare the two retention patterns' results, the average rating values were transformed such that the clearcut scene's average value became zero and the uncut forest -scene's value became 100.

Findings about Perceptions of Harvests' Appearance

The order of the average ratings was as expected, with the regeneration harvest ratings falling between, or statistically equal to, the clearcut and uncut scenes' ratings. Answers to the study questions are:

1. The uninformed average ratings of the clearcuts versus the regeneration harvests were statistically the same, with the exception of the scenic beauty ratings of the aggregated retention harvest. There, the regeneration harvest was rated much higher than the clearcut (Figures 3 and 4).
2. The effect of information upon acceptability ratings of the regeneration harvests increased them substantially (Figures 3 and 4). But, there was no such effect upon the scenic beauty ratings of the dispersed retention scene (Figure 4), and there was a small but significant information effect upon the scenic beauty ratings of the aggregated retention scene (Figure 5).
3. There was no significant difference between the acceptability ratings of the dispersed versus aggregated harvest retention patterns, when compared either with or without information. Information had the effect of increasing acceptability ratings of both harvest patterns by the same statistical amounts (Figure 5).
4. The aggregated retention pattern proved much more beautiful than the dispersed retention pattern, and by a margin greater than is likely accounted for by the differences in the scenes simulating the two patterns. Information had the effect of raising the scenic beauty rating of the dispersed retention harvest about half way up to that of the aggregated pattern--with or without information (Figure 5).



Conclusions about Perceptions of Harvests' Appearance

This is a preliminary study to the main DEMO social perceptions study. The following conclusions are tentative pending that study.

Regeneration harvests, as now prescribed by the NFP, offer little hope of garnering better social perceptions than traditional clearcuts when simply seen without information about their management intentions. But, public knowledge about new forestry offers to enhance perceptions of the acceptability of such harvests. Such knowledge is much less likely to significantly affect perceptions of the scenic beauty of NFP style regeneration harvests.

The dispersed versus aggregated 15 percent retention patterns do not differ significantly in their perceived acceptability, either with or without information. No recommendation can be made on that basis.

But, there is a difference in the perceived scenic beauty of the two patterns. For this quality, aggregated 15 percent retention patterns should garner more public value than dispersed retention patterns. This may be important among observers without an ideological or vested interest in harvests. Public knowledge may increase scenic beauty perceptions of dispersed harvests a bit up toward that seen in aggregated retention harvests--when these are seen with or without knowledge.

Literature Cited

- Dietrich, W. 1992. *The final forest: The battle for the last great trees of the Pacific Northwest*. New York: Penguin.
- Gale, R.P. 1991. Forest resource-dependent communities and the New Forestry: how wide the welcome mat in the Pacific Northwest? *Northwest Environment Journal* 7:733.
- Gobster, P.H. 1996. "Forest aesthetics, biodiversity, and the perceived appropriateness of ecosystem management practices." In M.W. Brunson, L.E. Kruger, C.B. Tyler, and S. A. Schroeder (eds.). *Defining social acceptability in ecosystem management: A workshop proceedings; 1992 June 23-25, Kelso, WA*. USDA For. Serv. Gen. Tech. Rep. PNW-369.
- Hansis, R. 1995. The social acceptability of clearcutting in the Pacific Northwest. *Human Organization* 54:95-101.
- Ribe, R. 1999. Regeneration harvests versus clearcuts: Public views of the acceptability and aesthetics of Northwest Forest Plan harvests. *Northwest Science*. (in press).
- Shindler, B., P. List, and B.S. Steel. 1993. Managing federal forests: public attitudes in Oregon and nationwide. *Journal of Forestry* 93(7):36-42.
- USDA For. Serv. 1996. *Landscape aesthetics: A handbook for scenery management*. Agriculture Handbook 701. Washington, DC: U.S. Government Printing Office.
- Wilkenson, C.F., and H.M. Anderson. 1987. *Land and resource planning in national forests*. Washington, DC: Island Press.
- Yaffee, S.L. 1994. *The wisdom of the spotted owl: Policy lessons for a new century*. Washington, DC: Island Press.

Landscape Aesthetics, "Not a Clear Cut Situation"

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Purpose and Scope

The Scenery Management System is a tool for integrating the benefits, values, desires and preferences regarding aesthetics and scenery for all levels of land management planning.

Landscape Aesthetics: A Handbook for Scenery Management describes scenery management as an integrated part of ecosystem management. Ecosystem Management (EC) is the framework for all levels of assessment and planning (including forest planning). It is recognized that approaches to planning through EM are constantly changing and will continue to do so. This document is intended to be a living document in a form that can be updated as the need arises.



The *Scenery Management System* provides an overall framework for the orderly inventory, analysis, and management of scenery. The system applies to every acre of national forest and national grassland administered by the Forest Service and to all Forest Service activities, including timber harvesting, road building, stream improvements, special use developments, utility line construction, recreation developments, and fuel breaks. The Scenery Management System may also serve needs for scenery management outside national forests in the United States and in other parts of the world.

The Scenery Management System establishes the following:

- Common terminology.
- Consistent procedures for inventory, analysis, and synthesis.
- Standards and guidelines for scenery management.
- Techniques for monitoring.

Why Is Scenery Management Necessary?

People are concerned about the quality of their environment, including the aesthetic values of landscapes, particularly scenery and spiritual values.

People need natural-appearing landscapes to serve as psychological and physiological "safety valves" for these reasons:

- The world's urban population pressures are increasing.

- Technology is rapidly advancing.
- Demands for goods and services are increasing.
- People's lives are becoming more complex.
- Urban pressures are demanding more land for development.
- Once plentiful natural-appearing landscapes are becoming more scarce.

The Forest Service uses the Scenery Management System as the framework for integrating all scenery management data into all levels of Forest Service planning, including the following:

- National overview
- Regional plans
- Landscape province analysis
- Forest plans
- Watershed, viewshed, or landscape unit analysis
- Detailed project plans
- Project implementation
- Project monitoring

Research has shown that high-quality scenery, especially that related to natural-appearing forests, enhances people's lives and benefits society. Therefore, the Scenery Management System aids Forest Service managers in providing benefits to people and society. Research findings support the logic that scenic quality and naturalness of the landscape directly enhances human well-being, both physically and psychologically, and contributes to other important human benefits. Specifically, these benefits include people's improved physiological well-being as an important by-product of viewing interesting and pleasant natural-appearing landscapes with high scenic diversity.

Findings from psychological and physiological studies of people under stress, people recovering in hospitals, people in recreation settings, and people in other various settings prove that natural landscape scenes have restorative and other beneficial properties. This is particularly important when contrasted with built urban environments such as pedestrian malls and commuter traffic routes.

Results of research by Dimberg, Ulrich and Simons are shown in Figures 1 and 2 below. Figure 1 displays people's heart rate in beats per minutes, and shows their positive response to spatially open landscapes of high interest. Figure 2 compares the positive responses (lower blood pressure) of people responding to nature as opposed to their responses to traffic routes and pedestrian malls.

In turn, when people feel better mentally and physically, they demonstrate increased on-the-job productivity, increased community involvement, and expanded family interaction. There is, therefore, an improved well-being of society in general.

The benefits of high-quality scenery are numerous despite the fact that a dollar value is seldom assigned to it except in regard to real estate appraisals and areas with major tourism influences.

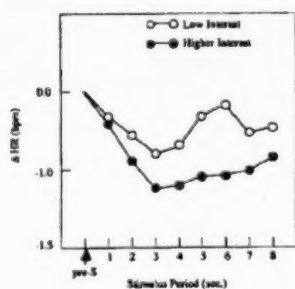


Figure 1. Mean phasic heart rate change, expressed in beats per minute (bpm), from the pre-stimulus level for subjects exposed to slides of spatially open landscapes (higher Interest) and spatially restricted environments (lower interest). (From Dimberg and Ulrich.)

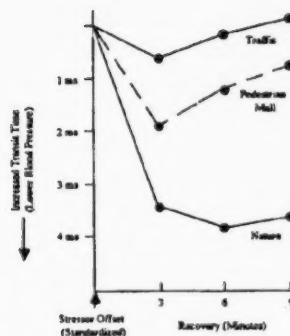


Figure 2. Pulse transit time (systolic blood pressure correlate) during recovery from stress. (From Ulrich and Simons 1986.)

Figure 3 compares human physical and psychological responses (skin conductance during recovery from stress) to traffic, pedestrian malls, and nature. Figure 4 compares responses (muscle tensions during recovery from stress) to the same stimuli.

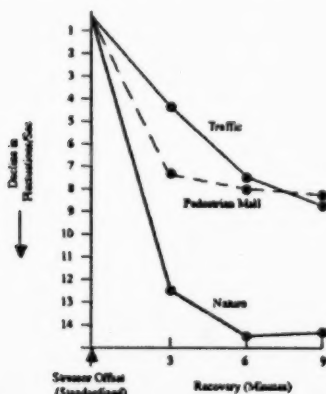


Figure 3. Skin conductance (SCR) during stress. (From Ulrich and Simons 1986.)

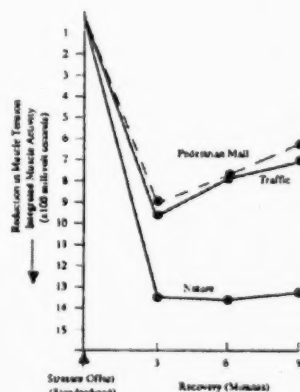


Figure 4. Muscle tensions (EMG) recovery from during recovery from stress. (From Ulrich and Simons 1986.)

It can be concluded that scenery management benefits people who are recreating, travelling for business, or otherwise passing through wildland environments.

Economists recognize that tourism is becoming the leading industry in many regions in the United States and in many foreign countries. In numerous communities adjacent to national forests, tourism and recreation are replacing the former leading roles of timber harvesting, mining, ranching, and farming. Scenic landscapes and recreational settings help to determine the success of recreation and tourism.

Scenery Management System Objectives

The goal of the Scenery Management System is to create and maintain landscapes having high scenic diversity, harmony, and unity for the benefit of society in general.

A Scenery Management System should:

- be logical and orderly.
- serve scenic assessment needs in all levels of planning and implementation, from broad-scale land planning to detailed project planning.
- produce goals and objectives useful for scenery management.
- allow scenery managers to be capable of interacting with values and needs of other resource disciplines.
- have a systematic approach so that others are able to replicate its results.
- serve as a communicative tool.

A Scenery Management System should identify the following:

- *Landscape character*, including existing landscape character attributes, potential landscape character, and the relative scenic attractiveness of various landscapes within a geographic area.
- *Visual sensitivity* of landscapes, based on the context of the landscapes being viewed, perceptual factors of people viewing those landscapes, and different visual characteristics of a landscape.
- *Scenic integrity*, including the continuum of scenic integrity levels, current integrity of landscapes, role of structures in the landscape, guidelines for determining cumulative scenic effects and allowable duration of scenic effects, and examples of scenes with various human actions that affect scenic integrity.

Handbook Objectives

Landscape aesthetics encompasses all senses—sight, smell, hearing, taste, and touch. However, research indicates that people receive 87% of their information about the world through their eyesight alone. Because the preponderance of human senses are by sight, this handbook deals primarily with the scenic aspects of a landscape. Other aesthetic values—sound, smell, touch, and taste—are also important, but are not handled in detail in this handbook.

The development of *Landscape Aesthetics: A Handbook for Scenery Management* was guided by the following:

- research findings.
- literature review (from 1732 to 1992).
- past experience in application of *The Visual Management System*, a handbook in use since 1974.
- past experience in application of subsystems of *The Visual Management System* developed after 1974.
- advances in technology.
- constituent demand for high-quality scenery.

The goal of this handbook is to explain scenery management as an integrated part of ecosystem management for all levels of planning, including forest planning. The objectives of this handbook are as follows:

- to develop and document a system of scenery management responsible for meeting both current and future needs.
- to develop a state-of-the-art Scenery Management System for resource managers that may be understood by constituents; to provide an overall framework for all landscape information for input into forest planning and project planning; to allow for creative and responsible alternative solutions for planners.
- to establish uniform procedures to identify demand for scenic quality and to identify differences between the current supply of, and future demand for, scenery.
- to establish uniform terminology and procedures to identify and classify physical and perceptual aspects of scenery.
- to establish direction for management of positive natural attributes and cultural elements in landscapes (including natural-appearing vegetation, landform, rockform, waterform, and positive human alterations) and of the overall desired scenic impression. These positive elements are defined as landscape character, and they are used to describe:
 - Existing landscape character
 - Scenic attractiveness
 - Long-established cultural landscape character
 - Existing landscape integrity
 - Landscape character goals.
- to establish direction for management of "cultural" scenic attributes in human-altered landscapes. In these landscapes, landscape character goals may include selected cultural elements that are accepted over time to become expected images and that contribute to high-quality scenery.
- to establish uniform procedures to identify and describe movement toward the desired landscape character in terms of scenic diversity and overall positive elements described as form, line, color, and texture. Scenic integrity objectives establish limits of acceptable human alterations as the landscape moves toward a landscape character goal.

Chapter 1 introduces landscape character, the overall visual impression of landscape attributes—the physical appearance of a landscape that gives it an identity and "sense of place." Landscape character ranges from that of a natural landscape to one that is urban—from a pristine wilderness to a built environment.

Chapter 2 discusses scenic integrity, the amount of human-caused deviation in form, line, color, and texture in a landscape.

Chapter 3 explores constituent information: expectations, desires, preferences, acceptable levels of quality, behaviors, and values. This information assists Forest Service managers in determining desired and preferred travelways, use areas, landscape character, and scenic integrity.

A Context for Scenery Management

Ecosystem management (EM) provides the foundation for planning and the necessary context and basis for managing scenery. *Landscape Aesthetics: A Handbook for Scenery Management* encourages integration throughout the entire systematic approach from inventory, analysis, planning, design, and implementation, to monitoring. Integration within the ecosystem planning framework relates the Scenery Management System to other relevant planning models for the biological, physical, and social dimensions of ecosystems.

- An ecosystem is a community of interacting organisms (including people) and their environment, the two functioning together to sustain life.
- An ecosystem management approach broadens the context and understanding of ecological communities and the environment.
- Through the integration of physical, biological, and cultural/social information in an interdisciplinary atmosphere, we strive to better understand ecological principles and their relationships (such as landscape pattern with components, structures, functions and processes of our ecosystem), to prescribe management which promotes sustainability.
- The essence of the ecosystem management conceptual framework deals with five basic questions:
 - How did the system evolve?
 - What is sustainable?
 - What do we have?
 - What do we want?
 - How do we move conditions from what we have to what we want?
- An ecosystem may be described on the head of a pin or encompass our planet (or any level in between). An ecosystem is always sandwiched between larger and smaller ecosystems, described in the *National Hierarchical Framework of Ecological Units*, such as the Ecoregion or Province, the Section or Subsection, the Landtype Association, or Landtype.
- Within a range of sustainable ecosystem management parameters there may be several landscape character options or variations that provide more diverse scenic character or that best reflect the integrity of special places. These solutions should be encouraged as the desired condition where scenic values are high.

Scenery Management Application

The Scenery Management System applies primarily within the cultural/social dimension of ecosystems management, but also has critical links to the biological and physical dimensions at various scales.

Within the ecosystem management context the cultural/social dimension deals with three basic questions:

- How do people influence the landscape?
- How does the landscape influence people?
- In time and space, what are the apparent trends and risks?

The frame of reference in the social dimension of EM varies from an individual human to large communities and their relationships to one another and to the landscape in terms of time and space.

Biological and physical dimensions look at how people influence the landscape and how the landscape influences people through time (past and present) and space. Combined with the social component, this defines the reference of acceptable ecological sustainability in which scenery management should operate.

Principles and Premises

Principles and premises for the Scenery Management System are based on research findings and 20 years' experience with *The Visual Management System*. The principles and premises are presented to give the reader an insight into the logic behind the Scenery Management System.

Fundamental Principles

1. Biological, physical and social factors create and influence scenery and interact to determine landscape character.
2. Landscape character varies greatly with the interaction of environmental factors.
3. People have the ability to perceive landscape character and develop expected images.
4. Through various activities, people have the ability to modify landscape character and scenic conditions and have often done so.
5. Such changes in landscape character and scenic condition often modify, suppress, or replace the original landscape character.
6. People value most highly the more scenic landscapes.
7. General, natural-appearing landscapes are the most valued.
8. Resource managers can design their activities to reduce adverse impact on landscape character and scenic integrity.
9. People have the ability to establish goals to maintain or create desired landscape character.
10. People have the ability to apply ecological, technical, and design knowledge to meet scenery management goals and objectives.
11. In some situations, resource managers perpetuate or create desired scenic environments to provide an improved quality of life.

Basic Premises

- People value highly scenic landscapes
 - Research shows that there is a high degree of public agreement regarding scenic preferences. This research indicates that people value most highly the more visually attractive and natural-appearing landscapes. However, the fact that preference may vary somewhat in different regions or cultures must be recognized.
 - Constituents have a voice, through forest planning, in establishing landscape character goals and scenic integrity objectives.

- Scenery contributes to a "sense of place." a mutually shared image.
 - According to Floyd Newby (1968), *"The majority of the recreation-oriented people who visit the National Forests have an image of what they expect to see. Such an image or mental picture is generated by available information concerning a particular area and the person's experience with that or similar areas. The image produced represents the knowledgeability, expectedness, romanticism, and emotionalism associated with features within the area. Obviously, several images may exist simultaneously, even within a single individual, and yet a particular geographic region tends to have an identifiable image."*
- Landscape character can be defined and managed
 - All landscapes have definable landscape character attributes that are positive natural elements such as landform, vegetative patterns, and water characteristics. In pastoral or rural/agricultural settings, positive cultural elements may include historic elements such as split-rail fences, stone walls, barns, orchards, hedgerows, and cabins. In urban settings, landscape character attributes may include a fabric of architectural styles. Combinations of these attributes define landscape character. The concept of landscape character is embodied in the "image of an area."
 - Landscapes that contains both diversity and harmony have the greatest potential for high scenic value.
 - Existing landscape character can be described at any scale associated with the aesthetic image of a place or landscape.
- Scenic attractiveness is important to constituents and is defined and mapped.
 - Scenic attractiveness measures the scenic importance of a landscape based on human perceptions of the intrinsic beauty of landform, water characteristics, and vegetation pattern. In combination, these attributes determine the natural scenic beauty of a landscape.
 - Environmental factors and natural forces create scenic attractiveness.
 - Scenic attractiveness can be described as combinations of attributes in natural or natural-appearing landscape. Landscape architects have developed criteria to inventory and map scenic attractiveness into three classes: A – Distinctive; B – Typical or Common; and C – Indistinctive.
 - In addition to mapping natural attributes of landform, water characteristics, and vegetation patterns, it may also be appropriate to map scenic attractiveness based on positive cultural elements such as split-rail fences, stone walls, barns, orchards, hedgerows and cabins.
- Natural events may affect scenic attractiveness; generally, human activities do not.
 - Scenic attractiveness of landscapes may be altered, either temporarily or permanently, by natural events such as hurricanes, tornadoes, floods, volcanic eruptions, earthquakes, and wildfires.

- In most cases, human activities cannot modify scenic attractiveness. It remains constant, even if a direct human activity such as timber harvesting alters scenic integrity. An indirect human activity, such as fire suppression that leads unintentionally to plant species succession, may affect scenic integrity and diversity of vegetative character.
- People cannot always distinguish between natural landscapes and those resulting from historic cultural alterations.
 - Over time, some areas have been changed in a manner that creates a new landscape character with positive scenic attributes. These are called desired pastoral landscapes. For instance, pithouse-village sites can add texture to a landscape. The house pits and modified vegetation can increase scenic diversity as a result of the rich soils and water retention capability of these sites.
 - Cultural landscapes are those with elements (either structural [e.g., fences, buildings, or roads] or modified natural areas [e.g., fields, hedgerows, windbreaks, canals, or earth mounds]) that produce an integrated whole reflecting a primary cultural activity. Examples include farmsteads, military posts, and plantations.
 - Examples of these desired pastoral landscapes include natural-appearing former cotton plantations now revegetated with forests, the mixed forests and fields of the Shenandoah Valley lands that have been cleared to create large open valleys, and mountaintop clearings or "balds" that offer unique scenic viewing opportunities.
- The public values cultural enclaves in landscapes that are natural or natural-appearing.
 - Small areas within natural or natural-appearing landscapes, historically modified but having a new character with positive scenic attributes, are called desired cultural enclaves. These cultural enclaves are normally small points or nodes within larger natural-appearing landscapes.
 - Cultural enclaves normally remain subordinate to the overall landscape. They include such elements as historic structures, split-rail fences, stone walls, orchards and other cultural attributes.
- Scenic integrity is important.
 - Scenic integrity is defined as the degree of direct human-caused deviation in the landscape, such as road construction, timber harvesting, or activity debris. Indirect deviations, such as landscape created by human suppression of the natural role of fire, are not included.
 - Scenic integrity is evaluated by measuring degree of alteration in line, form, color, and texture from the natural or natural-appearing landscape character or from the established landscape character accepted over time by the general public. This is done by measuring changes in scale, intensity, and pattern against the attributes of that landscape character.

- Visual absorption capability is an important tool.
 - Different landscapes have differing intrinsic abilities to absorb human alterations without loss of landscape character and without reduction in scenic condition.
 - Visual absorption capability depends on the landscape character attributes, landform complexity, and environmental factors such as climate
- Desires of constituents must be considered.
 - Constituents demand protection and management of scenery in national forests. They have expectations, desires, preferences, behaviors, acceptable levels of quality, and values of landscape character and scenic integrity.
 - Not all landscapes currently exhibit landscape character or scenic integrity desired by the public.
- Desires of constituents are synthesized into preferred landscape character and preferred scenic integrity for use in forest planning.
 - Landscape architects and forest planners, with the help of ecologists, silviculturists, and others, determine landscape and character themes. These themes must recognize both biological and economic reality.
- Landscape visibility is significant.
 - People view all lands from *somewhere at some time*. Landscape visibility is subject to many essential, interconnected considerations. These include context and experiences of viewers, expected images, position of observer in the landscape, number of people, and viewer scrutiny of the landscape caused by duration of view, viewing distance, air clarity, and visual magnitude.
 - Observer position depends on location of travel routes, residences, recreational areas, and bodies of water.
 - A landscape readily accessible to viewing by large numbers of people is often subject to greater scrutiny of its landscape character and scenic integrity. The context of view, experiences of viewers, and expected image of viewers also affect landscape visibility.
 - People have greater scrutiny of landscape character and scenic integrity when they view landscapes close up and for longer periods of time, or when they look at landscape surfaces from arterial views or at nearly perpendicular angles in steep terrain. People also have greater scrutiny of landscape character and scenic integrity when they view landscapes in a clear atmosphere or when landscape compositions focus their attention.
 - Landscape visibility can be maintained or improved through the development of vista sites, or reduced through vegetation regrowth or various management activities.

- Types of viewers are important.
 - Different types of people, engaged in specific activities, have varied concerns about scenic beauty of landscapes.
 - Types of viewers will vary by geographic region, as well as by travel route or use area, such as a developed recreation site, urban area, or backcountry area. Viewer expectations will vary according to the landscape setting and available recreation opportunities, primary motives of the viewer, and location, standards, and uses of travelways.
 - Constituents' varied concerns and expectations need to be identified and recognized to determine the relative importance and value of aesthetics in a national forest.
- Management activities vary in their intensity.
 - Some national forest resource management activities, such as range improvements, at least have potential for adverse effects on scenery. Others, like some timber harvest methods, have major scenic effects.
 - How visual elements of line, form, color, texture, and pattern of such activities relate to, or contrast with, natural landscape character attributes is important because we have the ability to alter, conserve, or damage landscape character.
 - Scenery management goals must consider other national forest resource management activities.
- Landscape settings required for certain management activities are important.
 - In certain cases, natural landscapes need to be maintained in order to meet goals for landscape settings for other resources. Such goals may include landscape character and scenic condition to meet some wildlife habitat needs, spiritual, recreational, watershed, or other resource management goals and objectives.
 - In many instances, other resource management goals will be complementary to natural or natural-appearing landscape character goals and the associated scenic integrity objectives. In these cases, all resource goals will reinforce each other,
 - On the other hand, certain combinations of resource goals may compete with each other. Mineral extraction and some timber harvest methods, for example, may require alteration of natural or natural-appearing landscape character and the associated scenic integrity objectives.
- Diversity is desirable.
 - Harmonious diversity in any landscape generally enhances scenic beauty. Increasing scenic diversity may lead to an increased level of public acceptance. Increased scenic diversity may also allow for greater ecological diversity.
 - However, scenic diversity needs to be selective and is not always aligned with ecological diversity. Activities undertaken to improve scenic diversity should be weighed against their possible negative effects on sustaining ecological systems.

- Conversely, activities proposed to create diversity toward a sustainable ecosystem could lead to undesirable scenic effects if care is not taken to consciously manage scenery.
- Harmony is desirable.
 - Harmony in the landscape generally increases scenic beauty. The public will normally not be aware of action taken to maintain visual harmony; it generally sees only discordant elements. Landscape harmony will lead to an increased level of public acceptance.
 - However, management activities are not always aligned with landscape harmony; activities to manage other resources may destroy the harmony of a landscape. Land managers must weigh such activities against their possible negative effects upon landscape harmony.
- Special places are important.
 - Special places are locations in the landscape with unique importance and meaning. At times, special places are isolated small areas or spots; at other times, they are large areas of land.
 - Special places often have "place names" indicating local or regional significance. Special places may be merited strictly because of scenic attributes.
 - Large special places of scenic value include areas such as Mt. Rogers in Virginia, Shining Rock in North Carolina, Redfish Lake in Idaho, and the Columbia River Gorge in Oregon and Washington.
 - They may also be small areas, such as a rocky grotto, a grove of unique trees, a special camp spot, a small pond or bog, or an isolated rock outcrop. Special places may be remnant vegetative communities or vegetative communities that exist far removed from their normal range.
- Variations in cultures
 - Though the ability to appreciate beauty is strongly linked to culture and varies from individual to individual and group to group, there are cross-human commonalities in the perception of beauty. In other words, beauty is not totally in the "eye of the beholder"; there are some cross-cultural physiological bases of aesthetics.

Variation in Public Values and Visual Quality Preferences

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Introduction

In the title of my talk, when I refer to *variation* in public values, I am referring to the idea that the importance of particular "forest values" varies across different social groups, as do preferences regarding visual quality. Finally, it is my contention that values—at least in part—underlie preferences about visual quality. My focus and data involve social survey research. But I believe that many of my conclusions are relevant to visual perception/preference studies using visual stimuli.

Social Group Membership

There is a need for more research on the relationship between group membership and cognitions about forests. Cognitions include values, attitudes, opinions, perceptions and preferences.

In the examples given here, for illustrative purposes, I focus on two main types of intergroup differences: 1) men/women, 2) Aboriginals/non-Aboriginals. Another important intergroup difference is that related to class and occupation. Forestry research has tended to use a very broad brush in terms of measuring class/occupation (e.g., income, forestry versus non-forestry). Social movement scholars (e.g., Brint 1984; Kriesi 1989; Inglehart 1990) have documented how specific occupation groupings are more likely to support post-materialist values and new social movements (such as the environmental movement). Attention to more nuanced class and occupational categories would likely show group differences regarding "forest values."

Understanding Intergroup Differences Regarding Environmental and Other Value Preferences

From a social science perspective, an important research design issue is the need to design research that will enable one to capture intergroup differences (Inglehart 1990; MacDermid and Stevenson 1991; Tindall 2001). In forestry circles, there is a tendency to talk about the general public as if there exists a single homogeneous entity. Where intergroup differences are explored, the tendency is to focus almost entirely on differences between geographic communities. While various types of demographic data are often collected in survey and related research on forest values and visual quality preferences, the data are primarily used in comparisons with census data in order to describe the representativeness of the sample. More emphasis needs to be given, in research on values, attitudes and opinions about forestry, on exploring intergroup differences. Now, there are some obvious types of comparisons to be made: for example, differences between different economic sectors, between urban and rural residents, and between those with different levels of formal education (Steel et al. 1994). There are also some other intergroup differences

that may not seem so obvious, or that present special challenges. One example of the former is gender.

Gender

Some forestry research utilizes gender as an independent variable. Often, however, more complex multivariate analyses could be undertaken that look at things like interaction effects (e.g., gender by urban/rural residence). Survey research has revealed persistent attitudinal and opinion differences on a variety of environmental issues between men and women (Mohai 1992; Davidson and Freudenberg 1996). While there are some issues where gender differences do not seem to occur, where there are differences, women are usually more concerned about environmental problems than are men (Brody 1984; Hamilton 1985; Blocker and Eckberg 1989). This observation is particularly relevant in the present context, given the fact that forestry is a male-dominated occupation (Thomas and Mohai 1995; Mohai and Thomas 1997; Simon 1997).

Aboriginals

An example of potential intergroup differences that provides a special methodological challenge, is that of examining differences between Aboriginals and non-Aboriginals (Adamowicz et al. 1998). In particular, some of the methods that work well with the general non-Aboriginal population (such as self-administered questionnaires or telephone interviews) do not work very well with Aboriginals (Bailey 1994). One barrier is simply culture, and a lack of familiarity with survey techniques that leads to high rates of non-response. A second issue is the history of cultural appropriation (in particular, by university-based researchers)—that makes some Aboriginals reticent about sharing their knowledge (McMillan 1995; Morrison and Wilson 1995). A third issue—relevant to British Columbia in particular—is the current state of the Indian Land Question (Tennant 1990; Kunin 1998; Boyd and Williams-Davidson). The fact that most Aboriginal groups in British Columbia are involved in the treaty process or a land claims process of some sort means that many individuals are reluctant to provide information to survey researchers for fear that it will be used against their community—by the government, by forest companies, or by other parties. This message was communicated to us repeatedly during our Forest Values project.

John Lewis, a graduate student of Stephen Sheppard, has done some very good research with an Aboriginal group in the Fraser Valley. His work has compared computer-based visual simulation with traditional maps. Simulation appears to be superior for communication purposes than are maps—at least for the elders he studied.

The Groups That Were Studied as Part of Our Quota Sample

The data I am going to describe come from a Forest Renewal BC- sponsored study of forest values. The main purpose of this study was to develop a survey instrument to measure forest values. We started out by doing interviews with 300 people throughout the province, in all of the forest regions. Our sampling strategy was to maximize variation in people's "relationship to the forest," thus we developed a quota matrix that enabled us to interview people in a variety of different occupations and voluntary organizations. Based on responses to the interviews, and on the literature, we developed a closed-ended questionnaire—and it is these data that I will discuss.

Relationship to Forests

Relationship to forests (in terms of paid or volunteer work) is the central variable we used for identifying potential respondents for this study. We identified 11 categories of work relationships (including both paid and volunteer work), plus the additional category of "First Nations" (discussed below); these are listed in Table 1. In Table 2, we also list various subgroups associated with each main group. Below we briefly describe the rationale behind the 12 categories we selected, as well as the sources we used for recruiting potential respondents. The categories are listed in alphabetical order. We reorganized these slightly for purposes of analysis and split out "environmental groups" from other "community groups."

Table 1. Broad Types of Groups Surveyed

<u>Groups Analyzed</u>
1. Artists/Writers
2. Community Representatives
3. Educators
4. Environment and Parks (Govt.)
5. First Nations
6. Forest Industry
7. Ministry of Forests, Managers, Employees
8. Environmental Organizations
9. Recreation Groups
10. Scientists
11. Tourism/Recreation Operators
12. Trappers/Ranchers
13. Unions

Table 2. Groups Identified for Sampling Purposes

Relationship to Forests Quota Matrix	
MAIN GROUPS	SUBGROUPS
Artists/Writers	☐ Artists (General) ☐ Painters ☐ Photographers ☐ Writers ☐ Sculptors
Community Groups	☐ Local Politicians ☐ Community Forestry Organizations ☐ Chamber of Commerce ☐ Local Environmental Groups ☐ Regional Environmental Groups ☐ National/International Environmental Groups
Educators	☐ Primary Educators ☐ Secondary Educators ☐ Post-Secondary Educators ☐ Outdoor Educators
Environment/Parks Managers and Employees	☐ Federal Parks Managers/Employees ☐ Provincial Parks Managers/Employees ☐ Local/Municipal Parks Managers/Employees ☐ Parks Canada Administration -- Managers/Employees (Dept. of Canadian Heritage) ☐ B.C. Ministry of Environment, Lands and Parks, Parks Division Managers/Employees
First Nations (Cultural Background)	☐ Representatives of First Nations from a Cross-section of Different Language Families in the Six Forest Regions.
Forest Industry Managers and Employees	☐ Small Business Owners/Operators

(Private Sector): Including: Harvesting, Saw Mills, Pulp Mills, Fine Paper Making, Value Added/Remanufacturing, Forestation/Silviculture, Non-Traditional.	☐ Managers/Supervisors ☐ Workers ☐ Private Forestry Consultants
Forest Managers and Related Government Employees (Public Sector)	☐ Forest Managers — MOF Regional ☐ Forest Managers — MOF District ☐ Forest Managers — MOF Operations ☐ Forest Managers/Employees Other
Recreation Groups	☐ Mountain Climbing ☐ Outdoor Recreation ☐ Naturalists ☐ Hunters ☐ Anglers ☐ Birders ☐ Local Hiking Groups ☐ Other Recreation Groups
Scientists	☐ Scientists — Ecologists ☐ Scientists — Trees ☐ Scientists — Plants ☐ Scientists — Animals ☐ Scientists — Soil ☐ Scientists — Water ☐ Scientists — Other
Tourism/Recreation Operators	☐ Tourism Workers ☐ Recreation Operators — Owners (General) ☐ Guides ☐ Outfitters
Trappers and Ranchers	☐ Trappers ☐ Ranchers
Unions	☐ Cross-section of Unions Involved in the Forestry Sector

Artists/Writers. As Margaret Atwood has noted, nature, wilderness, and the outdoors have been important canvasses for a variety of artists in Canada from painters to novelists. Artists and writers potentially serve as important sources for aesthetic values associated with forests and natural places. [Contact information for artists/writers has been obtained from: the Crafts Association of British Columbia 1997 publication, *Craft Contacts*; private and public art galleries; and personal communications.]

Community Groups. Community groups provide a source of forest-related values associated with community concerns, interests, and experiences. We have included a variety of community groups such as the Chamber of Commerce, environmental organizations, and forest worker organizations. Responses from representatives of these groups may shed light on values associated with decision-making and fairness, as well as on a range of other values (e.g., from economic to environmental). Environmentalists, in particular, may provide insights into intrinsic forest values and moral concerns relating to animal habitat, etc. [Contact information for community group representatives has been obtained from: the *Government of B.C. 1996 Telephone Directory* (British Columbia Queen's Printer.); the Public Affairs and Communication Branch of the Ministry of Environment, Lands, and Parks data base, 1996; the Fraser River Action Plan (Department of Fisheries and Oceans) Mailing List, 1996; *The British Columbia Environmental Directory*, 1995 (B.C. Environmental Network); and personal communications.]

Educators. Educators play an important role not only as conveyors of substantive knowledge about forests and natural places, but also as socialization agents of values that might be associated with forests. We sampled educators at a variety of different levels in the education system. [Contact information for educators has been obtained from: the Public Affairs and Communication Branch of the Ministry of Environment, Lands, and Parks data base, 1996; the

Fraser River Action Plan (Department of Fisheries and Oceans) Mailing List, 1996; the UBC Faculty of Forestry 1996 Annual Report; and personal communications.]

Environment/Parks Managers and Employees. Parks managers and employees have special concerns with both conservation and recreation. Ministry of Environment personnel have responsibility for environmental monitoring and protection. Such personnel have special insights into values such as biodiversity, ecosystem health and other environmental values. Conservation officers working for the ministry interact with recreationists such as hunters, and thus gain experiential insights into recreation values (such as hunting and fishing) and their relation to conservation values. [Contact information for environment/parks managers and employees has been obtained from: the *Government of B.C. 1996 Telephone Directory* (British Columbia Queen's Printer.); and personal communications.]

First Nations (cultural background). In addition to the 11 paid/voluntary work relationships, we've included "First Nations" (or cultural background) as a key category. While for sampling purposes we distinguish between First Nations and non-First Nations respondents, the main purpose of considering this criterion was to ensure that we sampled a critical number of First Nations respondents. It was also deemed important that this be a diverse sub-sample. Many First Nations have a distinct cultural, economic, and spiritual relationship to the land in general, and to forests in particular. While there is variation among individuals and different Aboriginal groups to the extent to which traditional culture and practices have been retained, the relationship to the land for many First Nations people is much more complicated than can be captured by the work relationships listed in Table 1. We sampled Aboriginal representatives from each of the different language families existing in British Columbia. This approach provided variation between different cultural groups. (The reason why First Nations are included in the Quota Matrix described in Table 1 is that we wish to ensure that we interview a critical number of First Nations representatives—even if their work relations fall outside the parameters for the other 11 categories described in Table 1.) [Contact information for First Nations has been obtained from: *A Guide to Aboriginal Organizations and Services in B.C.* (Ministry of Aboriginal Affairs, 1994/95.); the UBC Museum of Anthropology; *The British Columbia Environmental Directory*, 1995 (B.C. Environmental Network); and personal communications with Gordon Prest, Coordinator for First Nations Forestry, Forestry and Conservation Programs, Faculty of Forestry, UBC.]

Forest Industry Managers and Employees (Private Sector). Obviously, those employed in the forest industry have a rather important connection to forests and forest management. While economic values connected to timber seem most salient in considering values associated with this relationship, people working in forests, working with wood, and living in forestry-based community are also likely to have a variety of experiential values associated with forests. [Contact information for forest industry representatives has been obtained from a variety of publications including: the *Association of B.C. Professional Foresters Membership Directory*, Nov. 1996; *Major Primary Timber Processing Facilities in B.C.* (Ministry of Forests, 1996); *Madison's Canadian Lumber Directory* (1996); the Horse Loggers of B.C. Steering Committee List (1997), *1997 Big Book*; and *The Buyers and Sellers Directory of the Forest Products Industry*, 1997 (Random Length Publications, Inc., Oregon).]

Forest Managers and Related Government Employees (Public Sector). We considered it important to include forest managers as informants in our research, as they are in a special position to articulate the complexities of concerns about forest management. Forest managers gain insights from their specialized training through being the recipients of feedback from multiple publics and through undertaking their responsibilities associated with designing and/or approving forest land management plans. [Contact information for forest managers has been obtained from the *Government of B.C. 1996 Telephone Directory* (British Columbia Queen's Printer.); and the *Association of B.C. Professional Foresters Membership Directory*, Nov. 1996.]

Recreation Groups. Recreation groups are one of the most important types of groups whose relationship to forests is not closely connected to economic values. There is a diverse set of recreation groups in British Columbia. Most groups prioritize non-timber forest values, but some groups have no conflict with forestry. A variety of values associated with forests are important to recreationists. These include values related to wilderness, physical exercise, social interaction, and spiritual experiences. [Contact information for recreation groups has been obtained from the *Outdoor Recreation Council of B.C. - Provincial Member Groups*, 1997.]

Scientists. Scientists are able to serve as expert informants on a range of "scientifically informed values" such as biodiversity, ecosystem values, wildlife values, habitat values, etc. Scientists in concert with educators and writers are central to public socialization regarding forestry issues. [Contact information on scientists was obtained from: the *Government of B.C. 1996 Telephone Directory* (British Columbia Queen's Printer.); *UBC Faculty of Forestry 1996 Annual Report*; and personal communications.]

Tourism/Recreation Operators. Like those employed in the forestry industry, people employed in the tourism/recreation sector value forests for economic reasons. When considering contingent values, however, people in this category tend to be more concerned about management for non-timber values. [Contact information for tourism/recreation operator representatives has been obtained from the *Travel Industry Guide* (Tourism BC 1997).]

Trappers/Ranchers. Trappers and ranchers are two further groups whose livelihoods are often directly linked to the characteristics of forested lands. Again, like forest workers, trappers and ranchers hold unique values associated with the physical features of forests. While economic values are important to trappers and ranchers, they tend to be concerned with a different set of contingent forest values. [Contact information for trappers/ranchers has been obtained from: the B.C. Cattlemen's Association Steering Committee; and personal communications.]

Unions. Unions are important to many workers in the forest industry in British Columbia. It is through unions that many workers express their concerns about forestry. The interests and concerns of union representatives differ from those of company representatives on many issues. This difference of interests may serve as a basis for unique values associated with forest management, especially those associated with decision-making and fairness (or justice). [Contact information for union representatives was obtained from the same sources as listed for forest industry representatives, described above.]

The values listed above are provided for illustrative purposes, and should not be considered in any way exhaustive. While we feel that the paid/voluntary work relationships we have identified are important as sources for particular kinds of values, these relationships are not mutually exclusive, and people that we identify in one type of relation for selection to our sample usually have other relations to forests (and associated forest values). For example, some sawmill workers also engage in outdoor recreation, some scientists also belong to local environmental organizations, some First Nations representatives are educators, etc. The interview schedule was designed to obtain information on the multiple relationships, interests, and values that individuals may have.

Additional Criteria for the Quota Matrix

In addition, to the paid/volunteer work relationship criteria, and First Nations/non-First Nations (or cultural background) criteria, we used three additional variables as criteria for sampling: 1) gender, 2) forest region, 3) urban/rural representation.

Additional Criteria for Quota Matrix	
Gender	Minimum of 30% women.
Forest Region	Minimum of 10% in each of the six forest regions.
Urban/Rural Representation	Minimum of 60% of respondents will be selected from outside the Census Metropolitan Areas (CMAs) of Greater Vancouver, Greater Victoria.

Values

Understanding values associated with forests—their formation and consequences—is central to our study.

Clarifying Human Values Associated With Forests.

From a social science perspective, the term “values” is often, if not usually, misused in the context of talking about forestry issues. As a type of short hand I sometimes refer to this project as being about “forest values.” However, this term is somewhat misleading. In the context of talking about forestry, values are often thought of as physical things in the woods. The next question is usually: how much value does a particular thing have? (Reid et al. 1995; van Kooten 1995).

(I use the terms *human values* and *social values* interchangeably.)

For example, several years ago I participated in the UBC undergraduate forestry field school. In the field one day we had a speaker who raised the question, “What is the value of that wildlife tree?” We all stood around waiting for someone to answer. Eventually he answered his own question by responding that the value of the wildlife tree was \$64,000, or some such figure. He then went on to detail the operations costs incurred by leaving and protecting this particular wildlife tree.

While management decisions do have economic costs, this is not generally what social scientists are referring to when they talk about values—at least non-economists (e.g., Rokeach 1973; Hoult 1977; Chaplin 1985; Borgatta and Borgatta 1992; Manstead and Hewstone 1995; Kazdin 2000). In social science terms, values are cultural ideas about what are desirable goals and what are appropriate standards for judging actions (Rokeach 1973; Borgatta and Borgatta 1992). Put a slightly different way, they are emotionally charged beliefs about what is desirable, right, and appropriate (Howard 1996).

Values are broader in scope than normative beliefs (Hoult 1977) or than attitudes. According to Hoult (1977:343), the concept of values is “distinguished from belief on the grounds that values are preferences and beliefs are not; distinguished from norm in the sense that norms are fairly precise rules for behavior whereas values are general standards that are somewhat independent of specific situations.”

Hoult describes the concept of attitude as follows: “... traditionally, in both sociology and psychology, a general, learned, and relatively enduring tendency on the part of individuals to respond negatively or positively to given phenomena, such responses being based on the individual's evaluation of that which he believes about the phenomena – however, sociologists tend to view attitudes in relationship to social values (i.e., as the subjective aspect of values), whereas in psychology greater emphasis is placed on the relationship between attitudes and other aspects of the individual personality (hence, sociologists generally stress relationships between attitudes and factors *external* to the attitude-holder, while psychologists generally stress relationships between attitudes and factors which are *internal* so far as the attitude-holder is concerned) ... usually distinguished from both [values and opinions] on the grounds that neither involves tendencies to act, and that in addition, opinions are comparatively lightly held (i.e., not enduring).” (Hoult 1977:30).

Thus, according to Hoult (1977), an attitude refers to a general, learned, and relatively enduring tendency on the part of individuals to respond negatively or positively to a given phenomena. Sociologists tend to view attitudes in relation to social values (i.e., as the subjective aspect of values), while psychologists tend to focus on the relationship between attitudes and other aspects of the individual personality. There have been inconsistencies from time to time regarding how these phenomena have been defined, but the definitions provided above dominate across the non-economic social sciences (e.g., sociology, psychology, anthropology, social psychology, and political science). To the extent that different emphases are given in different disciplines (e.g., the relationship between attitudes and values as conceived by sociologists and psychologists), this article will provide a sociological perspective.

In sum, values in a sociological sense are to be located in people's heads, and in the behaviours and artifacts through which these are manifested. Some human or social values are connected to forest characteristics and forest management, but you cannot simply measure things in the woods to understand human and social values associated with forests (Tindall and Lavalley 1999).

A good deal of work on "forest values" (as well as on other natural resources and environmental values) is structured around asking respondents "how much are you willing to pay ...?" (Reid et al. 1995; van Kooten 1995; Foster 1997). While this type of research has its uses, what is much more interesting to social scientists (who are non-economists)—and ultimately more useful for forest managers and policy-makers who wish to understand intergroup conflict over forest management—is to look at the ways in which values underlie positions and concerns about forestry (Steel et al. 1994; Tindall and Lavalley 1999).

Just to extend this line of discussion a bit further, "willingness to pay" is not really about values, but about valuation in monetary terms (Foster 1997). Again, while such analyses provide managers with data that can be utilized for solving narrowly circumscribed problems, this type of analysis does not provide insight into the meaning of such preferences, and it is inappropriate for many types of issues (Tindall and Lavalley 1999). For example, consider the question, "How much are you willing to pay to have women paid the same as men for work of equal value?" While there are some real economic considerations in establishing gender equity, in today's world, the question is beside the point because this is a moral issue. The appropriate response is: just do it! There are many other examples one could also use here. For published work on some of these issues, see Rokeach, 1973, 1979; Schwartz, 1992; Foster, 1997; Adamowicz et al. 1998; Steel et al. 1994; Xu and Bengston 1997; Manning et al. 1999.

Value Indicators and Value Indexes

As mentioned earlier, we conducted interviews about forest values with 300 people throughout the province. Then, based partly on these interviews and upon the literature, we developed a closed-ended questionnaire to measure forest values and related phenomena. Section 1 of the Forest Values Questionnaire required respondents to rate the importance of 79 value indicators. The categories, and codes for these items were: 1 = Not Important, 2 = Somewhat Important, 3 = Very Important, 4 = Extremely Important. These value indicators were treated as interval-ratio level variables in the analyses. Based on theoretical and substantive considerations, and upon results from factor analysis and reliability analysis, a set of abstract value indexes were created. These indexes, and the items that compose them, are listed in Table 3. To construct each index, responses for the indicators making up the value index were summed and the aggregate value was then divided by the number of indicators included in the index. The value of Cronbach's alpha coefficient of reliability is provided for each index in Table 3.

Table 3. Items Used to Construct the Abstract Value Indexes

Ecological Values $\bar{V} = .84$
• Healthy populations of wildlife and fish species
• Maintaining biodiversity
• Clean water
• Clean air
• Healthy soils
Recreation and Outdoor Experiences $\bar{V} = .83$
▪ Outdoor recreation in wilderness (e.g., large unlogged natural areas)
▪ Outdoor recreation in large natural but non-wilderness settings (e.g., areas that have logging activity)
▪ Outdoor recreation in developed natural environments (e.g., provincial car campgrounds, lakes or beaches with

facilities)

- Gaining survival knowledge and skills
- Having a sense of competence in the woods
- Having a sense of competence in recreation activities
- Knowing and identifying natural phenomena (e.g., birds, plants)
- Gaining an understanding of natural systems and processes
- Having a sense of connection to nature
- Sharing time spent outdoors with friends and family
- Having a sense of place (getting to know and feel at home in a particular natural environment)

Aesthetic Values $\forall = .84$

- The beauty of your community
- The beauty of natural areas surrounding your community
- The beauty along major transportation corridors
- The beauty of natural areas in which people recreate

Community Sustainability $\forall = .75$

- Continued existence of smaller cities/towns around the province
- Low unemployment in communities and the province
- Community social stability (absence of large population fluctuations)
- Community economic diversity
- Community economic stability
- Community economic growth

Cultural Values $\forall = .83$

- First Nations traditional beliefs and way of life
- First Nations sacred sites and artifacts
- Sites and artifacts of Canada's history

Economic Values $\forall = .81$

- Provincial economic growth
- Provincial economic diversity
- Provincial economic stability
- High paying work
- Companies or industries that are profitable

Work Values $\forall = .71$

- Physically challenging work
- Work that provides a variety of job experiences and required a range of skills
- Work where there is a sense of community
- Meaningful work (work that give you a sense of purpose or meaning)
- Intellectually challenging work
- Working outdoors

Science and Education Values $\forall = .77$

- Scientific information and education about the functioning of natural ecosystems
- Scientific information and education about the habitat needs of wildlife
- Scientific information and education about growing trees and tending plantations
- Scientific information and education about forest pests and diseases
- Scientific information and education about the effects of different timber harvesting methods
- Scientific information and education about First Nations' traditional knowledge and use of natural products and areas
- Scientific information and education about British Columbians' values associated with forests

Equity Values $\forall = .66$

- Rights of future generations (inter-generational equity).
- Rights of non-human plant and animal species to exists in their natural habitat (regardless of their use to

humans)

- Rights of First Nations to resources on their traditional territories
- Equity between resource communities and large cities in the province
- Equity among different resource communities of the province

Based on the mean value for each value index, we ranked the value categories. Table 4 provides a listing of the nine abstract values ranked by their average importance from most important to least important, for the entire sample.

Table 4. Ranking of Value Category Means, for Entire Sample

1. Ecological/Environmental
2. Science and Education
3. Community Sustainability
4. Aesthetic Values
5. Work Values
6. Outdoor Recreation Experience
7. Economic Values
8. Equity Values
9. Cultural Values

Next we compare intergroup differences for the rankings of the value categories. We have broken the table into two parts, partly to enhance visibility, but also (for a variety of reasons) because we ended up with a small N for some groups. In Table 5A, all groups have an N > 10. In Table 5B, some of the N's are < 10.

Table 5A. Ranking of Value Category Means by Group (Relationship to the Forest)

	2 Community Representatives	3 Educators	4 Environment and Parks (Govt)	6 Forest Industry	7 MOF Managers Employees	8 Environmental Organizations	9 Recreation Groups	10 Scientists	11 Tourism /Recreation Operators
1 Ecological/ Environmental	2	1	1	1	1	1	1	1	1
2 Science and Education	4	5	2	5	4	4	5	5	4
3 Community Sustainability	1	7	7	3	3	6	8	6	5
4 Aesthetic Values	7	3	6	7	6	5	3	4	2
5 Work Values	5	8	4	4	5	8	4	2	7
6 Outdoor Rec Experiences	8	4	3	6	8	7	2	3	3
7 Economic Values	3	9	8	2	2	9	9	9	9
8 Equity Values	6	6	5	8	7	3	6	7	6
9 Cultural Values	9	2	9	9	9	2	7	8	8

Table 5A: What do we see?

- Almost universally ecological/environmental values are ranked first.
- After ecological/environmental values there is quite a bit of variation.
- Value rankings tend to be associated with the "relationships" associated with the group.

For example:

- Community representative rank community sustainability 1st.
- Educators rank cultural values 2nd.
- Environment and Parks personnel rank outdoor recreation experiences 3rd.
- Ministry of Forests personnel rank economic values 2nd.
- Recreation groups rank outdoor recreation experiences 2nd and aesthetic values 3rd.
- Tourism/recreation operators rank aesthetic values 2nd and outdoor recreation experiences 3rd.

Because the N's for Table 5B are somewhat smaller, we need to be cautious about the results here. Yet they tell the same story:

- Artists/writers rank aesthetic values 2nd and outdoor recreation experiences 3rd.
- First Nations rank equity values 2nd and cultural values 3rd.
- Trappers and ranchers rank economic values 2nd.
- Unions rank community sustainability 2nd and economic values 3rd.

When we look at several of the protagonists (environmental organization members, forest industry personnel) over forestry disputes, we see some predictable contrasts.

For example:

- Forest industry personnel rank economic values 2nd; environmental organization members rank economic values 9th.
- Forest industry personnel rank cultural values 9th; environmental organization members rank cultural values 2nd.
- Environmental organization members rank equity values 3rd; forest industry personnel rank equity values 8th.

One of the most interesting patterns of contrast concerns that between Ministry of Forests personnel and Environment and Parks personnel:

- Ministry of Forests personnel rank economic values 2nd; Environment and Parks personnel rank economic values 8th.
- Ministry of Forests personnel rank community sustainability 3rd; Environment and Parks personnel rank community sustainability 7th.
- Environment and Parks personnel rank outdoor recreation experiences 3rd; Ministry of Forests personnel rank outdoor recreation experiences 8th.

Table 5B. Ranking of Value Category Means by Group

	1. Artists/ Writers	5. First Nations	12. Trappers /Ranchers	13. Unions
1. Ecological /Environmental	1	1	1	1
2. Science and Education	4	5	3	4
3. Community Sustainability	5	6	4	2
4. Aesthetic Values	2	8	8	8
5. Work Values	6	4	6	7
6. Outdoor Recreation Experiences	3	7	5	9
7. Economic Values	7	9	2	3
8. Equity Values	9	2	7	6
9. Cultural Values	8	3	9	5

Again this pattern reflects the relationships that these different groups of government employees tend to have. One of the primary concerns of Environment and Parks personnel is "outdoor recreation," thus they are more likely to highly rank this value. One of their main client groups is recreationists. Ministry of Forests personnel have to deal with timber concerns, and their main client groups include forest companies and communities. Thus, they are more likely to highly rank economic values and community sustainability. It is also interesting that, while like most groups both Ministry of Forests personnel and Environment and Parks personnel ranked ecological/environmental values 1st, Environment and Parks personnel rated science and education values somewhat more highly than did Ministry of Forests personnel. In British Columbia, both of these groups have some involvement in planning processes, but Ministry of Forests personnel have much more involvement, and arguably more power. However, these two groups have somewhat different values—values that are in part shaped by their relationship to the forest and their different client groups.

A variety of authors have observed differences between urban and rural residents. Table 6 shows value rankings for the respondents in our sample. A few contrasts of note:

- Both urban and rural residents ranked ecological/environmental values 1st.
- Rural residents ranked community sustainability 2nd; urban residents ranked this 8th.
- Rural residents ranked economic values 4th; urban residents ranked this 9th.
- Urban residents ranked aesthetic values 2nd; rural residents ranked this 5th.
- Urban residents ranked outdoor recreation experiences 3rd; rural residents ranked this 7th.

Table 6. Ranking of Value Category Means by Urban/Rural Residence

	Urban	Rural
1. Ecological/Environmental	1	1
2. Science and Education	5	3
3. Community Sustainability	8	2
4. Aesthetic Values	2	5
5. Work Values	4	6
6. Outdoor Recreation Experience	3	7
7. Economic Values	9	4
8. Equity Values	7	8
9. Cultural Values	6	9

Table 7 shows rankings by gender:

- Women ranked outdoor recreation experiences 3rd; men ranked this value 7th.
- Men ranked economic values 5th; women ranked this 9th.
- Men ranked community sustainability values 2nd; women ranked this 7th.

Table 7. Ranking of Value Category Means by Gender

	Woman	Men
1. Ecological/Environmental	1	1
2. Science and Education	2	3
3. Community Sustainability	7	2
4. Aesthetic Values	4	4
5. Work Values	5	6
6. Outdoor Recreation Experience	3	7
7. Economic Values	9	5
8. Equity Values	6	8
9. Cultural Values	8	9

In Table 8, I've combined the Ministry of Forests and forest industry respondents in one group and all others into a "non-forestry" group. Part of the rationale for this is that, based on a variety of factors (relationship to the forest, experience in forests, socialization, perceived interest), there may be systematic differences between professionals and non-forestry respondents. Combining the two "forestry groups" can be justified by the fact that they have virtually identical profiles in their ranking of values. I think this is also potentially interesting because forestry professionals should know if and how their values differ from others.

Table 8. Ranking of Value Category Means by Forestry/Non-Forestry Groups

	Forestry	Non-Forestry
1. Ecological/Environmental	1	1
2. Science and Education	4	2
3. Community Sustainability	3	6
4. Aesthetic Values	6	3
5. Work Values	5	7
6. Outdoor Recreation Experience	7	4
7. Economic Values	2	9
8. Equity Values	8	5
9. Cultural Values	9	8

Table 8: What do we see?

- Ecological/environmental values ranked 1st.

- Economic values ranked 2nd by forestry professionals and 9th by non-forestry respondents.
- Aesthetic values ranked 3rd by non-forestry respondents and 6th by forestry respondents.
- It seems that there are systematic differences in the value rankings of forestry versus non-forestry respondents.

Finally, we come to some visual forest management issues (Table 9).

Table 9. Frequencies for Visual Forest Management Opinion Items (in Percentage)

Opinion items:	Strongly Agree	Mostly Agree	Partly Agree/Disagree	Mostly Disagree	Strongly Disagree	Don't Know/No Opinion	N
1. Clearcutting should not be stopped just because people think it is ugly.	26.9	32.2	16.4	8.2	15.8	.6	171
2. Visual corridors should not be created just because people think logging "is ugly."	17.3	25.0	23.8	22.0	10.1	1.8	168
3. The creation of visual corridors should be discouraged because they give a false impression of forest managements by covering up the bad forest practices of forest companies.	8.9	19.0	31.0	28.6	11.3	1.2	168
4. Visual corridors are unnecessary. We should take pride in logging instead of trying to hide it.	10.7	11.3	25.0	31.5	18.5	3.0	168
5. Visual corridors are good for tourism.	17.4	46.1	24.0	6.0	2.4	4.2	167
6. More attention should be devoted to minimizing the visual effects of logging on the landscape.	16.5	28.8	27.1	21.8	3.5	2.4	170

Table 10 is a cross-classification table describing the relationship between respondent's scores on the aesthetic values index (high or low), and their opinion about a variety of visual forest management issues. The purpose of this analysis is to illustrate how general values underlie preferences about more specific visual forest management preferences.

I focus upon how opinion/preference items are associated with aesthetic values. The items associated with "aesthetic values" combined to produce an alpha score = .84, indicating strong inter-item reliability. An index was created from these items. To interpret the index score: the higher the index score, the more important aesthetic values were to the respondent. For the purpose of providing an easily interpretable example, the continuous "aesthetic values index" has been transformed into a dichotomous variable. The categories are "Low" (all values at or below the median) and "High" (all values above the median). The opinion items were developed directly from interview data and reflect sentiments articulated by respondents.

Table 10. Cross-classification of Aesthetic Values Index by Ratings of Visual Forest Management Opinion Items (in Percentage)

Opinion items:	Respondents' score on aesthetic values index (High or Low)	Ratings in Percentage								Π^2 Value, and Significance
		Other	Strongly Agree	Mostly Agree	Partly Agree/Disagree	Mostly Disagree	Strongly Disagree	Don't Know/No Opinion	N	
1. Clearcutting should not be stopped just because people think it is ugly.	High	2.4	15.5	28.6	16.7	31.1	22.6	1.2	84	$\Pi^2 = 22.20$, p. # .001
	Low	0	37.6	34.1	16.5	2.4	9.4	0	85	
2. Visual corridors should not be created just because people think logging "is ugly."	High	2.4	10.6	20	20	28.2	15.3	3.5	85	$\Pi^2 = 18.14$, p. # .01
	Low	0	23.5	29.6	25.9	16	4.9	0	81	
3. The creation of visual corridors should be discouraged because they give a false impression of forest managements by covering up the bad forest practices of forest companies.	High	1.2	8.3	14.3	31	31	11.9	2.4	84	Non-significant
	Low	0	8.6	23.5	30.9	25.9	11.1	0	81	
4. Visual corridors are unnecessary. We should take pride in logging instead of trying to hide it.	High	2.4	7.1	5.9	16.5	32.9	29.4	5.9	85	$\Pi^2 = 27.57$, p. # .001
	Low	0	13.6	17.3	30.9	30.9	7.4	0	81	
5. Visual corridors are good for tourism.	High	0	20	50.6	12.9	3.5	4.7	8.2	85	$\Pi^2 = 21.66$, p. # .001
	Low	1.3	15.2	41.8	32.9	8.9	0	0	79	
6. More attention should be devoted to minimizing the visual effects of logging on the landscape.	High	0	28.2	32.9	24.7	9.4	1.2	3.5	85	$\Pi^2 = 28.60$, p. # .001
	Low	0	4.9	25.9	29.6	32.1	6.2	1.2	81	

In panels 1 to 6 of Table 10, a series of cross-tabulations are provided that present the bivariate relationship between the Aesthetic Values Index and a series of opinion items. For example, panel 1 relates to the opinion item, "Clearcutting should not be stopped just because people think it is ugly." Of people who highly rated aesthetic values, 15.5% strongly agreed with the statement. By contrast, of respondents with a low rating for aesthetic values, 37.6% strongly agreed with the statement.

In all instances but one (Item 3), there was a statistically significant relationship in the direction we would expect based on knowledge of respondents' ratings of aesthetic values. "The expected direction" refers to the tendency that people who have a greater preference for aesthetic values are more likely to favour ameliorating the visual effects of clearcutting, and to favour the creation of visual corridors. (In the exception, the relationship was not statistically significant but still in the same direction.)

To further illustrate the way in which abstract values underlie opinions and attitudes about forest management, Table 11A presents a set of bivariate correlations between the six attitude/opinion items (presented in Table 1) and nine abstract values associated with forest characteristics and management that we identified in our survey. For the purposes of this analysis, the attitude/opinion items are treated at interval/ratio level variables. (Table 11B provides a summary of these findings, without the correlation coefficients.)

The response categories are coded as follows: 2 = "Strongly Agree"; 1 = "Mostly Agree"; 0 = "Partly Agree/Disagree"; -1 = "Mostly Disagree"; -2 = "Strongly Disagree". "Don't Know/No Opinion" responses were excluded in this analysis (these account for less than 10% of all responses for each of the attitude/opinion items).

I would like to focus on a subset of the correlations listed in Table 11A, namely those associated with the following abstract values: 1) ecological values, 2) outdoor recreation experiences, 3) aesthetic values, and 4) economic values.

The first three values correspond to the first three columns of Table 2, while economic values is associated with column six. To interpret the table: a positive correlation means that the more highly that respondents rated the importance of the abstract value, the more strongly they tended to agree with the statement on the left (and vice versa).

Conversely, a negative correlation means that the more important the abstract value was to respondents, the more strongly they tended to disagree with the statement on the left (and vice versa). For example, people who highly valued ecological values tended to disagree with the statement "Clearcutting should not be stopped just because people think it is ugly" ($r = -.28$, $p > .005$), while people who rated economic values highly tended to agree with the statement ($r = .20$, $p > .01$).

As other researchers have found, attitude/opinion items tend to be associated with particular clusters of values and related belief systems or world views. They are not just simply correlated with particular values such as "aesthetic values." World views are made up of a number of a abstract values; in other words, values can be seen to be elements of broader world views.

In the example illustrated by the findings in Table 11A (and Table 11B), people who support the creation of "visual corridors" and feel that the "ugliness" associated with clearcutting is justification enough to stop the practice tend to rate ecological values, outdoor recreation experiences, and aesthetic values as being more important (amongst others).

Also, people who endorse these values tend to be distinguished from those who rate economic values as being more important. As suggested by some of the correlations in Table 2, we tended to find similar patterns of findings for economic values and community values. One striking exception was for opinions about community forestry (not shown here). Those respondents who tended to place importance on community values tended to support community forestry, while those who tended to place importance on economic values did not support community forestry. Presumably this is because community forestry is not seen as being a strategy of "optimization" in purely economic terms—though this finding merits further analysis. As one can see from

Table 11A, with the exception of attitude/opinion item five (where only one of the correlations is statistically significant), the sign of the correlation for economic values with the attitude/opinion items is opposite to the signs for ecological values, outdoor recreation experiences, and aesthetic values.

Table 11A. Bivariate Correlations Between Abstract Values and Opinion/Attitude Items Concerning Visual Aspects of Forest Management

Attitude/Opinion items:	Abstract Values								
	Ecological Values	Outdoor Recreation Experience	Aesthetic Values	Community Sustainability	Cultural Values	Economic Values	Work Values	Science and Education	Equity Values
1. Clearcutting should not be stopped just because people think it is ugly.	-.28***	-.24***	-.37***	_.01	-.28***	.20**	_.015	-.19*	-.22**
2. Visual corridors should not be created just because people think logging "is ugly."	-.32***	-.25***	-.38***	.20*	-.18*	.28***	0.02	_.06	0.01
3. The creation of visual corridors should be discouraged because they give a false impression of forest managements by covering up the bad forest practices of forest companies.	0.14	0.09	_.02	_.01	0.1	_.011	.18*	0.12	.20*
4. Visual corridors are unnecessary. We should take pride in logging instead of trying to hide it.	-.31***	-.23***	-.35***	.22**	-.26***	.24***	0.03	_.05	_.08
5. Visual corridors are good for tourism.	0.12	0.03	.17*	_.012	0.05	0.03	0.08	0.01	_.07
6. More attention should be devoted to minimizing the visual effects of logging on the landscape.	.31***	.23***	.44***	_.07	.23***	-.20*	0.05	.24***	0.13
Notes: * p. ≤ .05, ** p. ≤ .01, *** p. ≤ .005									

These results parallel those of other social scientists such as Cotgrove (1982) and his distinction between the "Dominant Paradigm" and the "Alternative Environmental Paradigm"; Catton and Dunlap (1978) and their distinction between the "Dominant Western World View" and the "New Environmental Paradigm"; and Inglehart (1990) and his distinction between "Materialist" and "Post-Materialist" values. Overall in our survey, we found a distinct pattern of results that distinguished those who were more likely to rate economic values as being important, and those who rated other types of non-economic values as being important. Steel et al. (1994) conducted similar research on the Oregon and national publics in the United States. They found that variation for specific forest management attitude/opinion items could be explained whether the orientation of respondents was "Anthropocentric", "Intermediate," or Biocentric.

Table 11B. Summary of Bivariate Correlations Between Abstract Values and Opinion/Attitude Items Concerning Visual Aspects of Forest Management

	Abstract Values								
	Ecological Values	Outdoor Recreation Experience	Aesthetic Values	Community Sustainability	Cultural Values	Economic Values	Work Values	Science and Education	Equity Values
Attitude/Opinion items:									
1. Clearcutting should not be stopped just because people think it is ugly.	-	-	-		-	+		-	-
2. Visual corridors should not be created just because people think logging "is ugly."	-	-	-	-	-	+			
3. The creation of visual corridors should be discouraged because they give a false impression of forest managements by covering up the bad forest practices of forest companies.							+		+
4. Visual corridors are unnecessary. We should take pride in logging instead of trying to hide it.	-	-	-	+	-	+			
5. Visual corridors are good for tourism.									
6. More attention should be devoted to minimizing the visual effects of logging on the landscape.	+	+	+		+	-		+	
Notes: "-" indicates a significant negative correlation. "+" indicates a significant positive correlation.									

In general, these findings and those of other researchers suggest that there is a broad category of people who tend to value forests primarily in instrumental and economic terms, and a second category who tend to value forests for "their intrinsic values," and for ecological, experiential, and cultural reasons (Catton and Dunlap 1978; Cotgrove 1982; Inglehart 1990; Steel et al. 1994; Xu and Bengtson 1997; Manning et al. 1999). Different clusters of values are important to people in these two different categories.

The points I wish to emphasize from the material presented in this section are:

- 1) Specific abstract values (such as the relative importance of "aesthetic values") underlie attitudes and opinions about forest management issues such as clearcutting and visual corridors.
- 2) People's preferences regarding specific abstract values such as "aesthetic values" tend to be associated with other abstract values, and these packages of values form world views that structure opinion and attitudes about forest management.

Much intergroup conflict about forest land use and management seems, on the surface, to be rooted in disagreements about specific practices but is really reflecting conflicting world views.

The final analysis I will show you returns to the question of if and how forestry professionals differ from non-forestry professionals in their opinions and preferences.

Table 12. Ratings of Visual Forest Management Attitude/Opinion Items for Forestry and Non-Forestry Respondents

Opinion items:	Ratings in Percentage			
	Forestry or Non-Forestry Respondent	Mean Rating	N	Sig of t-test at .05 level?
1. Clearcutting should not be stopped just because people think it is ugly.	Forestry	2.21	42	SIG
	Non-Forestry	2.65	126	
2. Visual corridors should not be created just because people think logging "is ugly."	Forestry	2.46	41	SIG
	Non-Forestry	2.95	122	
3. The creation of visual corridors should be discouraged because they give a false impression of forest managements by covering up the bad forest practices of forest companies.	Forestry	3.16	43	N.S.
	Non-Forestry	3.11	121	
4. Visual corridors are unnecessary. We should take pride in logging instead of trying to hide it.	Forestry	2.90	41	SIG
	Non-Forestry	3.52	120	
5. Visual corridors are good for tourism.	Forestry	2.46	41	N.S.
	Non-Forestry	2.21	117	
6. More attention should be devoted to minimizing the visual effects of logging on the landscape.	Forestry	2.93	43	SIG
	Non-Forestry	2.55	121	
Scale for Opinion Items: 1 = Strong Agree, 5 = Strongly Disagree.				

Table 12: What do we see?

- Significant differences in four of six cases. Non-forestry respondents are more concerned about visual aspects of forest management. As there are systematic differences between forestry and non-forestry respondents, and I have demonstrated how values underlie preferences, I think these results emphasize the importance of forestry professionals finding out the values and preferences of others—as it is likely that these values and preferences differ from those of members of the forestry profession.

Additional Conclusions

- Much of the research on visual preferences ignores potential intergroup differences and treats perceptions as responses that are unmediated—that are simply a function of visual stimuli.
- I would like to challenge the assumptions that underlie these research tendencies.
- I would suggest that perceptions and preferences are mediated by values, experiences, and other things—and that these mediating processes are associated with group membership.

Health and Economic Benefits of Forested Scenes

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Objectives

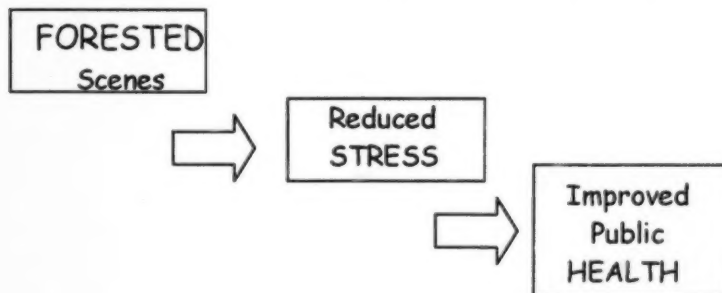
- Describe scientific research showing that viewing trees enhances emotional well-being, reduces stress, and in certain situations improves health
 - discuss how these benefits are likely affected by different cutting or silvicultural systems
- Discuss why health-related benefits of trees can be important for generating economic value, including by possibly enhancing creativity and performance in high value generation occupations

Stress

- Is a serious, pervasive problem affecting public health in cities and rural areas
 - stress has many negative effects on health
- Restoration or stress reduction provides a key scientific starting point for understanding how forested scenes can improve well-being and health, produce economic value

Stress: Examples of Negative Effects

- Psychological
 - feelings of tension, anger, depression
- Physiological
 - higher blood pressure, release of stress hormones, suppression of immune function
- Behavioral
 - sleeplessness, outbursts of hostility, alcohol abuse, reduced thinking performance



Summary of Findings From Several Studies: Effects of Scenes Dominated By Trees

- Such scenes foster significant restoration or stress recovery within 5 minutes or less
 - substantial positive shifts in emotions/feelings
 - positive changes in activity levels in physical systems (such as autonomic, electrocortical)
- Promote improved medical outcomes in healthcare patients (reduced pain, anxiety)

Urban Roadsides and Commuter Stress

(Parsons, Tassinary, Ulrich, et al., 1998)

- If:
- 1) Commuting in cities is stressful, and
 - 2) Many major urban roads lack trees and other nature

Then: Do prominent trees and other nature on roadsides reduce commuter stress?

Schedule of Experimental Session

(Parsons, Tassinary, Ulrich, et al., 1998)

START				FINISH
<u>5 mins</u>		<u>10 mins</u>	<u>10 mins</u>	<u>10 mins</u>
Baseline		Stressor	"TRIP"	Work Task

- Each video "trip" consisted of 20 segments of road
- For each trip, one-half were 10 control segments- the other half (10) consisted of one of four roadside environments

Effects of Roadsides on Stress

(Parsons, Tassinary, Ulrich, et al., 1998)

- Subjects (n=160) were randomly assigned to one of four roadside environments:
 - urban without nature
 - urban with some nature
 - designed nature (parks, golf courses)
 - nature at urban/rural edge

Findings: Stress Recovery During "Trip"

(Parsons, Tassinary, Ulrich, et al., 1998)

- Built roadsides, especially Urban without nature, slowed and reduced recovery compared to nature-dominated
 - designed nature recovered most in SCR and heart rate; urban without nature least
 - nature at urban/rural edge and urban with some nature recovered more in systolic BP
- Performance on thinking task/stressor after the "trip"
 - those exposed to designed nature with prominent trees performed most accurately

- nature at urban/rural edge attempted somewhat more problems; built without nature had lowest percentage of attempts

Findings: Stress Buffering During After-Trip Thinking Task

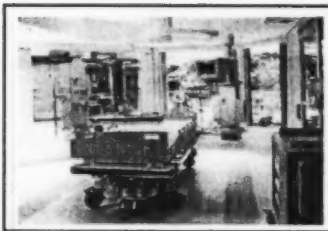
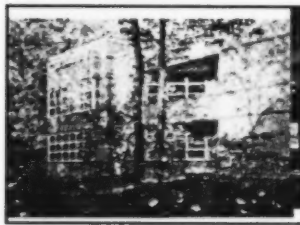
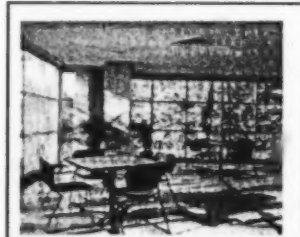
(Parsons, Tassinary, Ulrich, et al., 1998)

- Persons much less stressed if earlier they viewed nature-dominated rather than urban-dominated roadsides (SCR, $p < .001$)
- Ranking of stress reactions during task:

Urban without nature	<u>Most</u> Stress
Urban with some nature	↑
Designed nature	
Nature at urban/rural edge	<u>Least</u> Stress

Research Informed Healthcare Design With Trees

St. Michael's Health Center, Texarkana, TX



Legacy Health, Portland, OR:
Featured as exemplary
intensive care unit design by
Society for Critical Care
Medicine

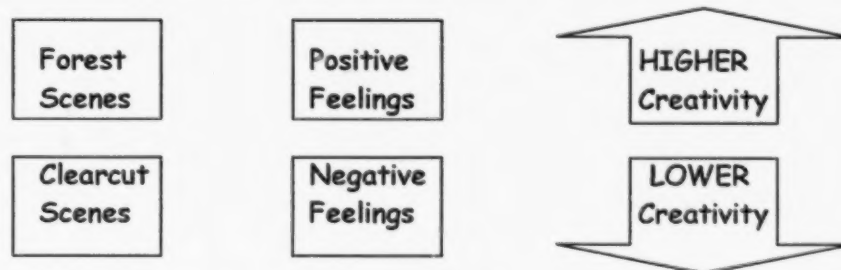
←
Nortalje Hospital, Sweden
Staff Break Area
→



HYPOTHESIS: Viewing Forests Enhances Creativity Via Positive Emotional Effects

- Research in psychology shows that positive emotions/feelings increase performance on creative, associational thinking (Isen and others)
- Because forested scenes (especially those reflecting preservation or retention) engender positive feelings, such scenes should also enhance creative thinking effectiveness

- Perhaps people tend to have more positive emotional states and are thus smarter in creative thinking when exposed to forested compared to clearcut or disturbed scenes forest areas, or urban areas lacking trees
- Do researchers in high technology firms tend to be more creative, have better ideas, and hence are more productive if their work-places have forested views?
-



Ulrich, 2001

Implications

- The importance of seeing forested scenes may be greater than previously thought
- If inappropriate cutting policies such as clearcutting produce widespread loss of visual quality, there will be human costs from lessened opportunities for restoration from stress. This will tend to worsen public health, including among urban populations.
- Preservation and retention practices, compared to clearcutting, increase forest visual quality and thereby promote enhanced emotional well-being. Good visual quality, by fostering emotional well-being, should tend to improve effectiveness in creative problem solving among the public. Given the decisive importance of creativity for generating value in a modern economy, this could substantially and upwardly revise estimates of the monetary benefits of forest visual stewardship.
- Sustainable forestry practices require the preservation or retention of trees, not only for protecting natural or forest ecosystems, but also for sustaining in the long term psychological well-being, public health, and economic prosperity in a modern knowledge-dependent economy.

Selected References

- Evans, G. W. and S. Cohen (1987). Environmental stress. In D. Stokols and I. Altman (Eds.), *Handbook of Environmental Psychology*. New York: John Wiley, 571-610.
- Hartig, T. (1991). *Testing restorative environments theory*. Unpublished doctoral dissertation, Program in Social Ecology, University of California, Irvine.
- Hartig, T., B66k, A., Garvill, J., Olsson, T. and T. Garling (1996). Environmental influences on psychological restoration. *Scandinavian Journal of Psychology*, 37: 378-393.
- Hartig, T. and G. W. Evans (1993). Psychological foundations of nature experience. In T. Garling and R. G. Golledge (Eds.), *Behavior and Environment: Psychological and Geographical Approaches*. Amsterdam: Elsevier/North Holland, pp. 427-457.

- Leather, P., Pyrgas, M., Beale, D. and C. Lawrence (1997). Windows in the workplace: sunlight, view, and occupational stress. *Environment and Behavior*, 30: 739-762.
- Orians, G. H. (1986). "An Ecological and Evolutionary Approach to Landscape Aesthetics." In E. C. Penning-Roswell and D. Lowenthal (Eds.), *Meanings and Values in Landscape*. London: Allen and Unwin, pp. 3-25.
- Parsons, R. and T. Hartig (2001). Environmental psychophysiology. In J. T. Cacioppo, L. G. Tassinary, and G. Berntson (Eds.), *Handbook of Psychophysiology*. New York: Cambridge University Press.
- Parsons, R., Tassinary, L. G., Ulrich, R. S., Hebl, M. R., and M. Grossman Alexander (1998). The view from the road: Implications for stress recovery and immunization. *Journal of Environmental Psychology*.
- Ulrich, R. S. (1979). Visual landscapes and psychological well-being. *Landscape Research* 4(1):17-23.
- Ulrich, R. S. (1984). View through a window may influence recovery from surgery. *Science*, 224: 420-421.
- Ulrich, R. S. (1986a). Human responses to vegetation and landscapes. *Landscape and Urban Planning*, 13: 29-44. Ulrich, R. S. (1991). Effects of health facility interior design on wellness: theory and scientific research. *Journal of Health Care Design*, 3: 97-109. [Reprinted in S. O. Marberry (Ed.), *Innovations in Healthcare Design* (pp. 88-104). New York: Van Nostrand Reinhold, 1995]
- Ulrich, R. S. (1993). "Biophilia, Biophobia, and Natural Landscapes." In S. A. Kellert and E. O. Wilson (Eds.), *The Biophilia Hypothesis*. Washington, DC: Island Press/Shearwater, pp. 74-137.
- Ulrich, R. S. (1999). Effects of gardens on health outcomes: theory and research. Chapter in C. C. Marcus and M. Barnes (Eds.), *Healing Gardens: Therapeutic Benefits and Design Recommendations* New York: John Wiley, 27-86.
- Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A. and M. Zelson (1991). Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology* 11:201-230.